DISSEMINATION OF SCIENTIFIC INFORMATION

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DISSEMINATION OF SCIENTIFIC INFORMATION

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Monday, May 25, 1959.

The committee met, pursuant to adjournment, at 10 a.m., Hon. Overton Brooks (chairman of the committee) presiding.

The CHAIRMAN. The committee will come to order.

This morning, members of the committee, we have Dr. L. Quincy Mumford, Librarian of Congress; Mr. Herman Henkle, of the John Crerar Library of Chicago; and Mr. Foster E. Mohrhardt, Director of the National Library of Agriculture.

We have first the pleasure of hearing from Dr. Mumford of the Library of Congress. Dr. Mumford has a prepared statement. I think all of the members of the committee have a copy.

Dr. Mumford, would you have a seat there, sir. We will be happy to hear your statement. This is the first time this committee has had Dr. Mumford appear before it although I daresay everybody with the committee has had more than one occasion upon which to call on him and his staff of the Library of Congress for assistance.

I will take this opportunity to thank the doctor for the services which he has rendered to the Members of the Congress and of this committee in his position as Librarian. Dr. Mumford, we welcome your presentation and the assistance you can give to the committee.

STATEMENT OF DR. L. QUINCY MUMFORD, LIBRARIAN OF CONGRESS [1]

Dr. MUMFORD. Thank you, Mr. Chairman.

The purpose of my presentation is to describe briefly the resources and services of the Library of Congress in science and technology.

Without going into historical reasons, the Library of Congress has come to be recognized widely both in this country and abroad as performing for the United States many of the functions of a national

[1] L. Quincy Mumford was appointed Librarian of Congress in 1954 and took office on September 1 o. that year. A native of North Carolina, he attended Duke University, from which he received the A.B and A.M. degrees. He also attended Columbia University's School of Library Service, from which he received a degree in library science. He worked in the Duke University Library and, after graduation from Columbia, in the New York Public Library, where from 1929 to 1945 he held several positions, from reference assistant to executive assistant to the librarian and coordinator of the general service divisions. In 1940 he was granted a leave of absence to organize the Processing Department of the Library of Congress and to serve for 1 year as its first Director. In 1945 he was appointed assistant director of the Cleveland Public Library and in 1950 became its director. He served in this position until his appointment as Librarian of Congress. A member of several library organizations, Dr. Mumford served in 1954–55 as the president of the American Library Association. He is at present a member of the Lincoln Sesquicentennial Commission; a member of the Advisory Committee to the Commissioner of Education on the Library Services Act; chairman ex officio of the Permanent Committee for the Oliver Wendell Holmes Devise; and a member ex officio of the Board of Regents of the National Library of Medicine, the Science Information Council, and the Board of Trustees of the National Cultural Center. He is the recipient of the Litt. D. degree from Bethany College, Rutgers University, and Duke University and of the LL. D. degree from Union College and Bucknell University.

library. The Library, as the Government's oldest and largest library, has had from its beginning the special function of serving the Nation. through service to the Congress, and its resources and facilities have been extended broadly to other Government agencies and to scholarly and research groups. The Library has been able to discharge its multiple responsibilities because in developing its collections and in providing the tools by which its collections can be used it has taken a comprehensive view of the role it was to play and responded comprehensively to the demands which the Congress, the scholarly community, and the public placed upon it.

The great segment of human knowledge represented by science and technology is an area in which heavy demands have been made on the Library for many years and in which the results in terms of collections and services have been correspondingly great. The Library of Congress has been preeminent in science since 1866 when, by act of Congress, the Smithsonian Institution's "complete collection of the memoirs and transactions of learned societies throughout the world and an entire series of the most important scientific and literary periodicals" were transferred to it in order that such literature might be more adequately housed and serviced. Since that time the growth of the scientific collections has continued steadily and with ever-increasing pace until, as of June 30, 1958, there were more than 1,486,000 volumes comprising monographs and serials in the classified collection of science and technology.

This great expansion has resulted from a variety of efforts. The Library continued and extended the foreign exchange program which had been begun by the Smithsonian. Today it draws materials from a worldwide network of more than 17,000 exchange agreements with governments and with private research centers, laboratories, universities, observatories, and other scientific and technical institutions. The annual yield from these sources is nearly half a million books, pamphlets, journals, and other materials in printed, near-print, and photocopy form. In the Soviet Union alone, 151 scientific and technical institutions exchange publications with the Library. When we consider in addition the Communist satellite countries, including East Germany, this figure is increased to 305. The use of the facilities of many U.S. agencies abroad serves greatly to enhance the receipts of the literature of other lands. Through the operation of the copyright law, the Library of Congress is assured that all American publications and many of the foreign ones in the scientific field that are registered for copyright find their way into the national collections. Still other materials in great quantity are constantly received as a result of domestic exchange arrangements, and by transfer, gift, and purchase.

Some 750 bookdealers throughout the world, with many of whom the Library has standing orders, provide publications of importance, regardless of language or country of origin. The magnitude of these operations may be seen from the fact that in the last fiscal year the Soviet Union provided through orders placed by the Library of Congress nearly 57,000 pieces and on exchange another 31,000 pieces in all fields of knowledge. The grand total of pieces received from the Soviet Union in that year, on order and through exchange, was 88,256. Exchanges with East European countries, including East Germany, produced 39,808 additional items.

The scope of the receipts of scientific material by the Library of Congress may be judged from the volume of periodical literature coming in from Soviet Russia. The literature of Soviet science and technology and its availability in the United States has received much attention in the press in recent months, but the situation is apparently not very clearly understood.

Contrary to the general impression that little is known of the output of science literature in the Soviet Union, there is a Soviet national bibliography of their book and periodical publications which I believe to be a fair representation of their total output. This bibliography is voluminous and detailed, and its issues are diligently scanned by members of the Library of Congress staff for use in our acquisitions as well as our bibliographical work.

The most recent volume of the Soviet periodical list that cumulates the output of the 5-year period 1950–54 gives a total number of 1,480 titles in science and technology, including medicine and agriculture. The latest volume of the "Monthly Index of Russian Accessions," a publication which the Library of Congress, with support from other agencies, compiles of its own Russian receipts and those of other American libraries cooperating with us, lists more than 900 titles in science, technology, medicine, and agriculture. These represent about 66 percent of all the Soviet journals received by the Library.

In monographic publications we are more selective in our acquisitions, since a considerable portion of the total literature published in any country must necessarily be of minor or no importance. The problem is one of evaluation, and we are constantly striving to improve the quality of our accessions in the broader aspects of Soviet publication. A recent analysis of a limited number of issues of the Soviet national list of books and monographic series indicated that, of more than 5,000 monographic series in the natural sciences and mathematics and in technology, about 2,000—or better than 38 percent—were found among the Library's collections. In the natural sciences and mathematics, we were 49.5 percent complete, while in all other fields of technology our figure was 36.6 percent.

One of the major services to the Nation which the Library of Congress performs, then, is the acquisition of the ever-increasing worldwide output of scientific and technical materials. On this great reservoir the Congress, the Executive departments and agencies, industry, the scientific community, and the public draw for their informational needs. That they are able to do so with facility and reasonable speed is due to the second great service performed by the Library—the cataloging and indexing of the materials received. This is a traditional library operation which is at once a highly technical and time-consuming process. For most materials, the Library of Congress printed catalog card serves very well, not merely for the Library's own collections but for the collections of the major research libraries throughout the country, many of which buy or otherwise utilize the cards which we prepare and print. The broad validity of the Library of Congress system of subject classification and the indispensability of the printed card is evidenced by the fact that the service has nearly 10,000 subscribers. The Library also maintains the National Union Catalog, containing cards locating research materials in 700 cooperating libraries in North America; and it publishes this and other catalogs in book form.

To make more quickly and completely available for use certain kinds of material, including acquisitions in science and technology, the Library publishes the following monthly lists: "New Serial Titles," listing the periodicals which the Library and some 200 other libraries receive; the "Monthly Index of Russian Accessions," the "East European Accessions Index," and the "Southern Asia Accessions List." The method is much the same for all of these publications. Special indexing is given to each article and, where necessary, the author's name and the article title are translated. Articles on science and technology are listed in a separate section with many subject subdivisions. An extensive subject index is added at the end of the volume. The volume of the "Monthly Index of Russian Accessions" for the year ending March 1958 covered periodical issues (not titles) totaling 8,929, of which 5,202, or 58 percent, dealt with science and technology. We have already noted that the number of Soviet titles in science, technology, medicine, and agriculture was over 900, to be specific 905, or 66 percent of a total of 1,368 titles received. During the same year, 5,632 monographs classed in these fields were also received. In the volume of the "East European Accessions Index" for the year ending December 1958, the number of journal titles listed was 3,856, of which 1,497 were classed as science and technology. The number of issues in all fields was 28,067, while those in science and technology numbered 8,444. The number of monographs received in all subjects was 7,735, while those in science and technology amounted to 2,275.

These specialized bibliographic productions make a formidable contribution to the national scientific effort but they by no means exhaust the contribution of the Library of Congress in this area. Within the limits of budget, space, and its primary commitment of service to the Congress, the Library has assumed responsibility for administering a number of large-scale projects which, on funds transferred primarily from the Department of Defense, provide analyses, abstracts, and other bibliographic services on certain types of literature, including scientific and technical material. Under this bibliographic program, the Library is making available to American scientific and industrial users, through the facilities of the Office of Technical Services of the Department of Commerce, a large volume of Soviet and other East European literature. In the past 12 months, 43,520 abstracts of periodical articles have been prepared, including 8,406 translations of foreign-language abstracts. Since August 1, 1958, a total of 29,947 abstracts has been made available to the Office of Technical Services. This abstracting service at the present time regularly covers 165 foreign journals, 141 of which originate in the Soviet Union. In addition to abstracts, 1,292 reviews in English of foreign-language monographs have also been prepared. Since the subject is often misunderstood, it should be pointed out that, though a considerable amount of translation work is a necessary part of the abstracting service just described, the Library of Congress does not as a normal function prepare or distribute translations of foreign scientific and technical materials as such and at the present time has no plans to do so.

The third great area of service by the Library of Congress in the field of science and technology is its work in reference and bibliography. The focal point of subject competence in this field is the Library's

Science and Technology Division, which maintains, on a 7-days-a-week basis, a special science reading room. Established in 1949, the Division, with a relatively small staff of subject and language specialists, has an active bibliographic and reference program, and its services are steadily increasing. The total reference services provided to the Congress, to other Government agencies, to other offices of the Library, and to the public, numbered 10,873 in fiscal 1958. From present trends, it appears that the total in the present fiscal year will reach approximately 14,000, or an increase of about 30 percent.

The reference services performed for the Congress in the form of special studies and other assistance numbered 143 in fiscal 1958. Present trends indicate that the number in the current fiscal year will reach 275, an increase of more than 90 percent over the preceding year. Nor is the mere number of these requests truly indicative of the increase either of the service to the Congress or the workload imposed on the staff. In 1 month—March 1959—the scope and length of the studies completed reached a point where they required the equivalent of 4½ man-months of professional staff time. The range of these inquiries and their difficulty is shown by the following examples of the subject covered: "The Effects of Atomic Radiation on Human Beings"; "Jet and Rocket Fuels and Oxidizers"; "Atomic-Powered Airplanes and Rockets"; "Underground Disposal of Radioactive Wastes"; "National Science Policy"; "Alcohol-Blend Motor Fuels"; "Cold-Weather Agriculture"; "The Future of Science"; and "Toxicology and Use of Thiocarbonyl Tetrachloride."

We could cite many more instances of this kind of studies which have been made, but these are more or less typical.

The division also has under preparation some 25 major surveys of the literature in various fields of science and technology. Several are being done on contract for the Department of Defense; others are supported by the National Science Foundation. Although most of these bibliographies are produced for and paid for by other agencies with a special need to know, those dealing with unclassified literature are in nearly all cases made available to the scientific community at large. The range of coverage of these bibliographies can be seen from their subjects, which include: the "International Geophysical Year," "Thermal Properties of Metals," "Aviation Medicine," "Industrial Applications of Radioactive Isotopes," and "Snow, Ice, and Frozen Ground."

The Science and Technology Division serves as a collecting and reference center for unclassified technical report literature of the United States and foreign countries. The output of a number of Government agencies and their contractors, including the Atomic Energy Commission, the National Aeronautics and Space Administration, and agencies within the Department of Defense, forms a good part of this literature. In addition to its other activities, the Division has a research program in documentation techniques, the objective of which is to make the Library's science collections more responsive to current trends and needs.

One other service of a very special and significant character may come into being this year. I refer to Public Law 85–931, amending Public Law 480 (1954), authorizing the Librarian of Congress, in consultation of the National Science Foundation and other interested

agencies, to acquire with U.S. foreign-owned currencies, publications (including materials in science and technology) from foreign countries; to catalog, abstract, index, translate, and reproduce such materials; and to deposit these publications—

> * * * in libraries and research centers in the United States specializing in the areas to which they relate. * * *

This program awaits an appropriation to enable the Library to put it into effect.

The dissemination of scientific and technological information throughout the Nation under this program could have a very significant impact on the availability of research information. That scholars should be able to acquire a knowledge of the existence of articles and books through indexes and catalogs is readily apparent. Of equal or greater significance is the ability to gain ready access to publications which appear to relate to a piece of research. Although libraries endeavor to acquire publications from abroad, limitations on funds and the tremendous amount of material available make reasonably complete coverage of foreign research publications an unattainable goal for most libraries. The Public Law 480 program would be a long step toward overcoming this shortcoming.

This brief survey of the resources and services of the Library of Congress in the broad fields of science and technology should serve to demonstrate that, by the breadth of its base, its wide acceptance as an authority in bibliographical know-how, the rich competence and variety of its staff, and its relationships with other institutions and organizations within and outside the Government, the Library of Congress serves as the national library of science. This role of the Library is supplemented and enhanced, rather than detracted from or weakened, by the two other great national library collections, those in agriculture and medicine held by the Library of the Department of Agriculture and by the National Library of Medicine. It has sometimes been suggested, and indeed it has been proposed in legislation, that by transfers of functions from existing libraries and by the accumulation of separate collections an independent national library of science and technology should be created, possibly within the framework of the proposed national Department of Science and Technology. In view of the existence of the three great collections mentioned and their long record of service to the Nation and cooperation in undisturbed harmony with each other, I have gone on record as opposing the creation of another national library of science as not only duplicative and wasteful but impossible to bring into being without many years of concentrated effort.

In this presentation today I have attempted to point out that the Library of Congress and, by that token, the Nation, already have a vast investment—perhaps the largest in the world—in the literature of science, and I believe that science, which in great measure relies for its stimulation and growth on that literature, has an equally great stake in the Library of Congress.

The CHAIRMAN. Thank you very much, Dr. Mumford.

Dr. MUMFORD. Thank you.

The CHAIRMAN. I have listened very attentively to your statement and I am impressed with the figures that you gave this committee.

You referred to the accumulation of periodicals and literature on

science from the Soviet Union and from the satellites of the Soviet Union and you gave some very large figures in this respect. Would you tell us though, Doctor, how complete is your service in this respect?

Dr. MUMFORD. In respect to the total output?

The CHAIRMAN. Yes, of the Soviet Union.

Dr. MUMFORD. Well, we think that this bibliography to which I refer is reasonably dependable as far as listing the journals that are being published, and on that basis it would appear that we are receiving about 60 percent or more of the total.

As I pointed out, there is naturally a great deal of material that is not important. It may consist of material that is published in more than one place. It might consist of translations from English or other journals around the world, but we feel that we are getting a very susbtantial part of the important material.

The CHAIRMAN. Do you feel that the 40 percent is not important?

Dr. MUMFORD. This is hard to say categorically, Mr. Chairman, and there may be some additional important material that we are not getting, especially from the provinces of the Soviet Union, but we feel that we are getting the majority of the important material.

The CHAIRMAN. Well, how is the material from the provinces? As a rule, is that new material or is it repetitious?

Dr. MUMFORD. Some of it might be new or unique, as far as procurements from the scientific institutions in the provinces. Our procurement emanates primarily from Moscow. We do not have the means of identifying and receiving publications completely systematically throughout the provinces of Russia, although we do have exchange agreements with many institutions in the provinces.

The CHAIRMAN. Do you have difficulty in setting up these exchange agreements?

Dr. MUMFORD. No, sir, in recent years it has been relatively easy to make exchange agreements.

The CHAIRMAN. Now, when you receive these publications from the Soviet, are they translated by your staff?

Dr. MUMFORD. They are abstracted to the extent that I have indicated here in the paper. They are listed in the "Monthly Index of Russian Accessions" and the author and title are translated and indication given of the nature of the article, but the whole article, of course, is not translated.

The CHAIRMAN. But it has to be translated before you can make a synopsis of it.

Dr. MUMFORD. I have here an example of the publication "Monthly Index of Russian Accessions." This is for one month, April 1959. I would be glad to pass it around if you would care to see it.

The CHAIRMAN. Mr. Finch will pass it around, Doctor.

Dr. MUMFORD. There are two issues, you might take April and May.

The CHAIRMAN. I notice you refer in your statement to the program which has been set forth in Public Law 480 of 1954. You state that you are short of money, that money has not been appropriated by Congress. What amount of money do you have in mind?

Dr. MUMFORD. Well, we have submitted a very substantial program, Mr. Chairman, to the Bureau of the Budget. As you know, the Bureau of the Budget controls the use of these funds under this

section of the act and the State Department is also concerned with it.

We do not know yet whether there will be complete approval of this program but it is a very substantial sum of money for operation in foreign countries. What we would propose to do in some instances is to set up centers abroad with persons on the spot to acquire materials from dealers, to strengthen our exchange relationships, and if possible, with native assistance, to catalog and do whatever indexing and also, perhaps, abstracting that was desired and necessary.

The CHAIRMAN. Well, can't you do that now with the accumulation of foreign currencies?

Dr. MUMFORD. Yes; if we had it, but the act provides it can only be done on money appropriated for this purpose and it has not been appropriated yet.

The CHAIRMAN. You mean foreign currency might be available but we have not appropriated it?

Dr. MUMFORD. That is correct. The program that we have outlined to the Bureau of the Budget and the State Department is based upon the availability of these funds in certain countries where we feel that we could fruitfully operate.

The CHAIRMAN. Well, if the money is available and is in foreign currency in these countries, then actually it would not cost this Government anything to make those foreign currencies available to you.

Dr. MUMFORD. The major part of it would not be any additional cost to this Government in terms of dollars. However, there would be a fractional cost in the implementation of the program in dollars because of the necessity of sending some American personnel abroad to operate the program.

Mr. FULTON. Mr. Chairman.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. Could we with your permission have put in the record at this point the amount of foreign currency available in these various countries which could be used for this purpose at Dr. Mumford's discretion, and secondly, what there might be by way of dollar supplemental funds that would be necessary. I believe this committee could specifically have an authorization that would then bring it specifically to the attention of the House Appropriations Committee. (See p. 14.)

The CHAIRMAN. We do not need an authorization. It is already authorized in Public Law 480, is it not?

Dr. MUMFORD. Yes, sir; under Public Law 480, as amended, section 104(n), I believe, authorizes the Librarian of Congress in consultation with the National Science Foundation and other agencies to acquire and catalog and index as I have indicated, but with funds appropriated for the purpose.

The CHAIRMAN. The other day the National Science Foundation was the beneficiary in an appropriation bill of about $3 million for that purpose. I notice that some of your funds come from the Defense Department.

Is there no way that the National Science Foundation money for this purpose and Defense Department money could be used as a cash contribution from this Government?

Dr. MUMFORD. Are you referring to foreign currencies already appropriated to them or to necessary dollars?

The CHAIRMAN. I am referring to dollars that are necessary.

Dr. MUMFORD. Well, the National Science Foundation can speak to that better than I can, Mr. Chairman. I have had some conversations with representatives of the Foundation relative to this but I have had no commitment on it.

The CHAIRMAN. They may have a separate program which would not encompass this.

Dr. MUMFORD. They do have a separate program relating particularly to translations.

The CHAIRMAN. It seems we are really missing a bet if for a few American dollars we are not taking advantage of the foreign currency available for this, which would be priceless information to us.

Mr. FULTON. Would the gentleman yield further? I wasn't quite through.

You see, Public Law 480 has been passed with a general authorization, and there has been no appropriation for allocation of funds made for this important purpose. I believe that it would be wise either for this committee or the Foreign Affairs Committee of which I am a member to authorize specifically and to direct that these funds be spent for this purpose.

Obviously, it isn't being given adequate attention by the House Appropriations Committee as time is going by.

Now, if the application has been made by the Librarian of Congress, Dr. Mumford, through the Bureau of the Budget, and there has been no action on it under a general authorization, I would like to have for the record, with your consent, the projected program which has been submitted to the Bureau of the Budget. We can then see it and then either as a member of this committee or the House Foreign Affairs Committee I will have it written into the authorization law specifically as distinguished from the general authorization in Public Law 480, which of course is only an agricultural surplus disposal act for U.S. products of agriculture abroad and is not a scientific approach in the least.

Therefore, where there is an authorization for science contained in an agricultural bill, I think it would be advisable either for this committee or the House Foreign Affairs Committee to separate the authorization and act upon a pure science project, separate from a U.S. agricultural disposal abroad act.

That is the trouble with it. It is a tail on an agricultural disposal act.

When the authorization is taken care of, such committees as the Science and Astronautics Committee should take over the direction of the money and see there is push behind it and that it is to be used for the proper purposes.

Of course, when Public Law 480 comes before the House Appropriations Committee they will see how we are going to take care of the Commodity Credit Corporation funds and also to see that the storage costs and the U.S. agricultural surplus products are shipped abroad. But that isn't the whole problem. Our vital interest in the problem is to see that once the money has been generated into what we call counterpart funds, that they become available to you, Dr. Mumford, and, believe me, I am going to be an eager beaver on it.

Mr. MILLER. Mr. Chairman.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. I was going to say you still have to generate the funds out of the Agriculture Department. Once the money is there, I think that some method can be devised for making it available for this purpose and for other purposes.

I see no reason why under this scheme we shouldn't use this money for paying all of the expenses, even translations in these countries and sending the finished document back here.

Mr. FULTON. May I agree with my friend from California and say this: Just because the money has been generated in a U.S. agriculture surplus disposal program abroad under Public Law 480 should not mean that those counterpart funds in the foreign countries in local currency then forever remain under the Agriculture Committee nor under the Appropriations subcommittee that deals with agricultural funds, because this is beyond their particular purpose.

To me, once the funds are generated and can be used for a scientific purpose, the authorization should then come from this committee under a program of this committee, and it should be referred to Congressman Thomas' subcommittee of Appropriations rather than to Agriculture.

Mr. MILLER. Doesn't the State Department have control over those funds?

The CHAIRMAN. Some go to the Defense Department.

Mr. FULTON. May I say this: The peculiar thing about it is that in the past 2 years the Agriculture Department has had several of us on the House Foreign Affairs Committee sit with them at the time of the Public Law 480 arguments in order to see what to do with these funds.

While we are talking about the executive departments, I believe it should be checked by our staff to see where on the House Appropriations Committee the appropriations problems go.

The CHAIRMAN. Let me say this, because I yielded to the gentleman.

Let me suggest this: Have our staff, Mr. Ducander, find out from the Appropriations Committee what their plans are without seeking to tell them what to do, because we don't want to exceed our jurisdiction. We can find out not only what their plans are for this but at the same time check into the possibility of a specific act to broaden the terms of the present authorization. It would seem to me it should cover not only agriculture funds but all counterpart funds available overseas.

Mr. DUCANDER. It might also be possible, Mr. Chairman, if I understand Dr. Mumford correctly, that the law could be amended so it wouldn't require specifically appropriated funds.

Isn't this one of the troubles?

Dr. MUMFORD. I believe so.

This is a rather complicated picture, and since last fall we have been conferring with the Bureau of the Budget, and with the State Department, directly on it. But I believe, if the language did not require or use the phrase "appropriated for this purpose," that perhaps the Bureau of the Budget would be able to allocate such funds directly. But I can't say that positively.

Mr. FULTON. Mr. Ducander does have a point there, but it has been decided by Congress that the House wants the appropriations

to be made by the House Appropriations Committee, and we have just done that on the housing bill. Therefore, when that has been the set policy of the House, we, I believe, will have to conform, but the problem is more than that. I feel that where there is a general authorization for counterpart funds use under Public Law 480, which is the U.S. agricultural surplus disposal program, that is not sufficient. This committee should take over with the specific authorization under which there will be appropriations, and we should set up a project for science use.

You see, we should be specific on the programs as to how these counterpart funds should be used for science. There is where I would disagree with the chairman.

I feel that there should be a specific authorization and a direction for the use of these funds for certain programs such as Dr. Mumford's, of the Library of Congress.

The CHAIRMAN. You don't disagree with the chairman. Let me say this: That is exactly what I propose—that we amend the law so as to cover specific authorizations from all foreign currencies now in our possession, whether normally considered counterpart funds, agricultural funds, or whatever their source or the origin of those funds.

Mr. FULTON. Then we don't disagree, if we are not putting it under the Public Law 480 program or under the mutual aid program, because counterpart funds are generated there, too.

The CHAIRMAN. Now I want to recognize Mr. Miller.

Mr. MILLER. Dr. Mumford, in Europe there are several institutions that make translations of foreign scientific journals or foreign scientific publications in connection with their work. There is one in Belgium and one or two in Germany that are under the direction of the Department of Defense.

Do they exchange this information or material with you or deposit any information that they circulate with you?

Dr. MUMFORD. I think that the Office of Technical Services, which distributes such material, could answer that better than I.

I assume if it is done under contract with a U.S. agency, it is made available generally to the scientific community here.

Mr. MILLER. I was just thinking we should have some central depository for scientific material.

I am perfectly willing that it be the Library of Congress, but when we spend Government money to acquire this knowledge in Europe—and I have visited some of these institutions—they must of necessity do a lot of translation. I think that material should be deposited somewhere.

Dr. MUMFORD. It would be my impression, Mr. Miller, that it is being disseminated here, but I can't answer that categorically.

Now, I referred to the number of journals that we are abstracting, and in some instances providing translations of the abstracts. Some of this work is being done here and some in Europe.

The National Science Foundation has a program, I believe, for translations, under contract with certain groups or parties in Europe, but my understanding is that that is all channeled back to the Office of Technical Services for dissemination here.

Mr. MILLER. Now there is one more thing: You are making translations of a lot of these things. Are any of them microfilmed for protection and preservation?

Dr. MUMFORD. We are not carrying on a program of microfilming them; no, sir. Whether the Office of Technical Services is when they receive them, I cannot say.

Mr. MILLER. Does the Library of Congress have any contact with other English-speaking countries such as England, Canada, Australia, where similar work may be done in exchange of information? Do the libraries in those countries get this bibliography you put out?

Dr. MUMFORD. I referred to our network of exchange agreements whereby we send foreign governments official U.S. publications in return for their publications.

Now, as far as exchange of abstracts, I don't know of any definite or substantial program of that nature.

Mr. MILLER. Would that be desirable?

Dr. MUMFORD. It might very well be.

You see, the Library has not been in the role of distribution. We have been in the role of production—producing abstracts which we in turn relay to the Office of Technical Services, from which they are made available generally.

Mr. MILLER. The thing I was concerned with was if we were doing certain work in this country and similar work were being done in England, it would be to the advantage of both countries to avoid duplication.

Dr. MUMFORD. Where there are such publications abroad, we would make efforts to acquire them, and this includes the abstracts by the Russians, themselves, of their journals.

The big difficulty there is the timelag. They are not received—they are not published promptly or received here quickly enough to serve the scientific community here.

Mr. MILLER. Thank you.

The CHAIRMAN. Mr. Hechler.

Mr. HECHLER. Would your program contemplate putting somebody in the U.S.S.R., if you had the funds?

Dr. MUMFORD. No; because there would be no Russian funds available. We are assisted, of course, by State Department procurement officers in Moscow in the obtaining of publications. We place orders with dealers, and we have our exchanges with the various institutions in Russia.

Mr. HECHLER. I think you have a very powerful case here in favor of not just sitting back and waiting for these materials to come in.

Dr. MUMFORD. We don't do that. We are diligently seeking out what is available, especially through the examination of the bibliographies that are published and through the procurement officers that are on the spot.

Mr. HECHLER. I was about to help you out with an argument for additional people in foreign countries as you mentioned and to use native translators.

Dr. MUMFORD. This would be done in certain countries under the Public Law 480 program.

Mr. HECHLER. That is what I was getting at.

Dr. MUMFORD. It would be done at key places. We have selected areas, in the program that we have proposed where there are now considerable amounts of available counterpart funds, U.S.-owned foreign currency, but having someone on the spot would obviously help a great deal, would intensify, strengthen the collecting and acquisition of materials.

Mr. HECHLER. I noted that in your early statement. I wondered if either in your submissions to the Bureau of the Budget or elsewhere you have set forth that argument.

Dr. MUMFORD. Yes, sir; we have.

Mr. HECHLER. If you feel there is any other information that you could supply to the committee in the way of justification, I think it would be helpful in pushing forward that program.

The CHAIRMAN. Doctor, I have not quite finished with my questions.

I want to ask you a few more questions.

Dr. MUMFORD. Yes, sir.

The CHAIRMAN. I had reached the point where I was querying you in reference to the money.

You mentioned dissemination of this material. You don't believe that is a program that the Library of Congress should undertake?

Dr. MUMFORD. Dissemination in the sense of publication of bibliographies like those I passed around—for example the "Monthly Index of Russian Accessions" showing what we have—is certainly a Library program. As for the distribution of abstracts, the Office of Technical Services, under statutory provisions, has that function spelled out rather clearly, I think.

The CHAIRMAN. But generally speaking, do you think dissemination of information of scientific matters should be a normal responsibility of the Library of Congress?

Dr. MUMFORD. About the availability of it, yes; about material in our collections, I think that would.

The CHAIRMAN. What part in the dissemination of that material should the National Science Foundation take?

Dr. MUMFORD. Well, as I conceive the role of the National Science Foundation, and from reading its rather broad charter, it has the responsibility of coordination of the efforts of other agencies, identifying areas where there are gaps and seeking to close those gaps, and this it does in various ways.

It has transferred funds to the Library for special projects, the compilation of special bibliographies, and also I believe it has a fairly extensive translation program, and on the other hand, the function of the Office of Technical Services seems to be one primarily of distribution, dissemination after the product has been produced.

I view our role primarily as that of acquiring, cataloging, indexing, and abstracting, and then to turn the product over to the Office of Technical Services for distribution.

The CHAIRMAN. So your responsibility ends there.

Dr. MUMFORD. Yes, sir.

The CHAIRMAN. Otherwise, you might become a circulating agency.

What I was thinking of, for instance in our program on missiles, it would seem to me that the National Science Foundation or the technical services or some other agency would know better what the mission or the program of the agencies of the U.S. Government would be and, therefore, would be in better position to distribute the information which has been collected, perhaps sort it out, too, and distribute what is proper to be distributed. Is that correct?

Dr. MUMFORD. That would be my general impression, Mr. Chairman.

The CHAIRMAN. Thank you, Doctor.

Mr. Fulton.

Mr. FULTON. I would like to follow up further the chairman's point of money.

Suppose that you had an adequate amount of money to do a thorough job of translation and obtaining of accessions from world scientific publications. What do you believe would be a safe level of the money necessary just in general terms?

Dr. MUMFORD. In terms of the use of foreign currencies?

Mr. FULTON. As well as U.S. dollars.

Dr. MUMFORD. Well, I don't have the exact figures here of our program, and I hesitate to mention a figure, but it runs into several million dollars for the use of foreign currencies, and it would be a few hundred thousand dollars for the implementation of it, where it is necessary to use dollars.

Mr. FULTON. Well, with the chairman's permission, would you then put a short statement on that point in the record?

(The information requested is as follows:)

LIBRARY OF CONGRESS

COLLECTION AND DISTRIBUTION OF LIBRARY MATERIALS AND RELATED FOREIGN CURRENCY PROGRAMS

Summary of proposed foreign currency activities or projects, Public Law 480

	Estimated obligations			Financing (1960 and subsequent obligations)	
	Through 1959	1960	After 1960	From balances brought forward	From proposed new authorizations
Total foreign currency	----------	$5,656,700	$8,937,000	----------	$14,593,700
Total U.S. dollar support	----------	216,800	383,200	----------	600,000
Grand total	----------	5,873,500	9,320,200	----------	15,193,700

The CHAIRMAN. Certainly, I think it is a very important matter. It is essentially the basis of all of these hearings.

Mr. FULTON. One other question, and I am through.

As you have probably heard, I have been interested in making the Library of Congress into a national library.

I would like you to tell us the advantages that there would be in having a national library instead of having it on the basis of a library of Congress.

I was particularly pleased by the beginning of your statement when you said:

> Without going into historical reasons, the Library of Congress has come to be recognized widely in this country and abroad as performing for the United States many of the functions of a national library.

We have a national museum, and I would like to see in this country a national library of really national scope.

My first question is this: What would be gained by it and what added services could be provided by it?

Rather than take the committee's time now, would you just put a statement in the record on that?

I have another committee session.

Dr. MUMFORD. Very well.

(The information requested is as follows:)

THE LIBRARY OF CONGRESS AS THE NATIONAL LIBRARY OF THE UNITED STATES

Although the Library of Congress does not bear the name "National Library of the United States," it performs for the Nation the functions of such a library. As Herbert Putnam, longtime Librarian of Congress (1899–1939), put it: "The Library of Congress—universal in scope, national in service."

The functions of national libraries vary, but each of them has some, and the Library of Congress has all, of the following characteristics:

1. A national library maintains comprehensive collections for the use of the Government, the scholarly world, and the public.

2. It benefits from official, intergovernmental exchange of publications.

3. It administers the Copyright Office, and its collections are enriched from the copyright deposits.

4. It receives gifts to the Nation in the form of trust funds and bequests and in the form of collections of personal papers, rare books, and other valuable materials.

5. It develops a comprehensive classification system, which is widely used by other research institutions, and cataloging codes, which are nationally accepted as standards.

6. It serves as a center for cooperative cataloging of books and other forms of material by the Nation's libraries, and it provides a national catalog card distribution service.

7. It maintains national union catalogs on cards, which serve as guides to the Nation's research resources in various forms (such as books and manuscripts) and in various fields (such as Hebraica and Slavica), and it furnishes information about the location of needed materials to those who cannot personally consult these tools.

8. It publishes a national bibliography, such as the Library's National Union Catalog.

9. It gives reference service on its premises and provides information from and about its collections by mail.

10. It participates in a nationwide interlibrary loan system, which enables it to share collecting responsibilities with other libraries and makes research materials generally available, thereby strengthening smaller libraries throughout the country by supplementing their research resources through those of the national library.

11. It has an active bibliographic program and makes the results of it widely available through publication.

12. It administers the national books-for-the-blind program.

13. It engages in cooperative bibliographic projects at home and abroad; and it works with other national libraries and national and international organizations to achieve standardization of rules in order to increase the accessibility of the materials of knowledge without regard to national boundaries and language barriers.

14. It conducts educational programs, chiefly through exhibitions of materials in its custody, publication, lectures and literary programs, concerts, and other activities, many of which may be financed through gift funds.

15. Last, but far from least, both historically and substantively, the Library of Congress serves the Government and people of the United States through service to Members and committees of Congress. Its entire resources are available to the National Legislature, and through its Legislative Reference Service a special research and information service is provided. This legislative reference service is more highly developed in the United States than in any other country.

Although authorization for these and other functions exists in many statutes and appropriation acts, this legislation had never been brought together. After L. Quincy Mumford took office as Librarian of Congress, the "codification, simplification, and completion of the statutes relating to the Library" was undertaken in accordance with requests from the Committee on Appropriations of the House of Representatives and the Committee on Rules and Administration of the Senate. A draft of this proposed codification has been submitted to the Joint Committee on the Library and it is now under consideration by the House Committee on Administration and the Senate Committee on Rules and Administration. If this codification is adopted, the Library of Congress will have a broad statutory charter to serve, as it now does in fact, as the national library of the United States.

The CHAIRMAN. Thank you very much, Doctor.

Are there further questions?

Mr. MILLER. Mr. Chairman, before the doctor leaves let us take note that he is accompanied by his charming and efficient assistant, Mrs. Hamer.

I just wanted to recognize Mrs. Hamer.

Mr. FULTON. And may we say that the doctor has submitted an excellent statement.

The CHAIRMAN. Thank you, Doctor, for your very fine statement.

Mr. FULTON. I have thought it such a fine statement I am prepared to put it in the Congressional Record.

The CHAIRMAN. Thank you, sir, again.

Dr. MUMFORD. Thank you, Mr. Chairman.

The CHAIRMAN. This morning we have Mr. Herman H. Henkle, of Chicago, of the John Crerar Library.

The doctor has come over here to help us with his testimony, and he has a prepared statement.

Doctor, if you will have a seat, the committee will be delighted to hear from you.

Now, Dr. Mumford, we would be happy to have you stay here, but it isn't necessary; if you have duties, we will understand your leaving.

Dr. MUMFORD. I would like to stay here and hear the other statements, if I may.

The CHAIRMAN. They will be good statements.

Mr. Henkle.

STATEMENT OF HERMAN H. HENKLE, OF THE JOHN CRERAR LIBRARY OF CHICAGO [2]

Mr. HENKLE. Mr. Chairman and gentlemen, may I preface my remarks on collecting and disseminating scientific information, and my answers to any questions which you may wish to ask, with a brief summary of my activities in this field?

The John Crerar Library in Chicago, which I administer, is one of the principal scientific libraries of the world, covering all of the basic sciences, all branches of engineering and medicine, and many technical aspects of agriculture.

It engages actively in information services to industry and government, publishes three abstract journals, maintains a large photocopying service, and administers the Special Libraries Association Translation Center.

Aside from this association, I am active in the Association of Research Libraries, the American Documentation Institute, the Special Libraries Association, and a number of committees devoting attention to problems of disseminating scientific information.

Prior to the fall of 1947, I served for 5½ years as Director of the Processing Department of the Library of Congress, and I can interpolate that every time I have a chance to come to Washington, it is like coming home.

[2] Herman H. Henkle, librarian, The John Crerar Library, Chicago, September 1947 to date. Prior positions included: Director, Processing Department, the Library of Congress (January 1942–August 1947); and director, School of Library Science, Boston (September 1937–January 1942). Lecturer, Graduate Library School, University of Chicago (1950 to date). Extra curricular activities include or have included a variety of activities related to responsibility for scientific information handling, *e.g.*: Member Special Committee on Technical Information, Research and Development Board, 1948–50; president, Special Libraries Association, 1945–46; president, American Documentation Institute, 1957–58; member, American Society for Metals, Metallurgical Documentation Committee, 1957 to date.

My purpose in presenting this preliminary statement is to indicate the field in which I feel competent to speak, and to comment on certain problems to which I would like to see this committee give its attention.

Of the greatest importance in the handling and disseminating of scientific information now and in the future is the development of electronic and mechanical equipment. Remarkable progress is being made in this field, but a vast amount of research and development is still needed. The Federal Government has made heavy investments in experimental work through the armed services and several civilian agencies and should, I believe, continue and expand its support of further research and development in every way possible. My competence to speak to technical questions in this field is extremely limited, but I am convinced that it is vital to the future utilization of information in scientific research and education in this country.

The Second World War disclosed that there were serious gaps in the holdings of American libraries in publications issued abroad. Under the leadership of the Library of Congress, the Association of Research Libraries sponsored a cooperative acquisition program designed to bring into the United States at least one copy of every book of research value published abroad. This movement is backstopped by several of the leading Government libraries, especially the Library of Congress, the National Library of Medicine, and the Library of the Department of Agriculture, and by the larger research libraries in public and private institutions throughout the country. It is of the greatest importance that the Government libraries mentioned above continue to receive the support of Congress in the expansion of their acquisition programs.

Another development should be mentioned in this connection that promises major improvement in the foreign resources of American libraries.

Beginning in 1957, the National Science Foundation has made grants to the Midwest Inter-Library Center in Chicago, to enable the center to acquire foreign scientific periodicals in chemistry and biology which are not available in any of the 20 research libraries which cooperate in maintenance of the center. Through the center and its cooperating libraries, it is now possible for any research organization in the country to obtain any scientific periodical currently indexed in two of the most important abstracting services—chemical abstracts and biological abstracts.

This program should continue to receive the support of the Foundation as one of the most economical means of strengthening the resources of American libraries in scientific literature. And this kind of assistance might well be extended to other regional centers which are prepared to give service on a national basis.

Another critical need to which more attention should be given by this committee is the field of abstracting and indexing. Here, also, National Science Foundation grants have been of the greatest importance in assisting publishing agencies in the actual production of abstracting and indexing services, and in underwriting costs of cooperative programs designed to improve the scope and economy of such services for all fields of science and technology.

There is a marked tendency among some documentalists, whose primary preoccupation is centered on developing machine systems, to minimize the importance of this type of information service. It

seems probable, however, that in time machine systems may replace the abstracting and indexing journals as the primary source for exploring the scientific and technical information available in book, periodical, and technical report literature. But this time appears as of now to be years in the future.

In the meantime, there is increasingly critical need for far more comprehensive coverage of the literature that is available now in rapidly increasing volume.

Such Government publications as the Current Index to Medical Literature (National Library of Medicine), Bibliography of Agriculture (Department of Agriculture Library), and Nuclear Science Abstracts (Atomic Energy Commission) should be constantly expanded to attain and maintain comprehensive coverage of the world literature of these fields. Beyond these important research tools, Government support should be extended through National Science Foundation grants, as aid may be required, to supplement resources being expended by societies and other private agencies to index the world literature in other physical and engineering sciences.

This advice is based on the fact that a major proportion of our national investment in research and development comes from agencies of the U.S. Government, either through research programs of Government agencies or through research and development contracts with universities, research institutes, and industries. The value of much of this research is lost, or at best has only temporary value, unless it is adequately indexed. One proposal often made is that every research budget should assign a percentage of its funds to assuring "secondary publication" of the results, a term which covers indexing and abstracting services. I suggest that the committee explore the possibilities for applying this principle to expenditure of Federal research funds.

The third problem to which I wish to call special attention in these remarks is that of increasing the availability of foreign scientific literature in English translation. Congress is to be commended for the support which it has given to the national program in this field, with, in some instances, the initiative having been taken by appropriation committees. It is difficult to overemphasize the importance of this service to research. Science is, in its very nature, international in character; and scientific information published in languages that cannot be readily understood by a majority of American scientists cannot serve as fully as it should in the advancement of science in this country.

There are now being published in cover-to-cover translation more than 60 of the more important scientific and technical journals published originally in Russian. Substantial Government grants have been largely responsible for this already creditable number. On the other hand, there is need for greatly increasing the amount of translation.

Whether this program should be limited to cover-to-cover translation of journals is a question that should be based on the advice of scientists. It seems probable that much of the translation of additional titles might be limited to the papers in foreign journals which report the results of fundamental research or of developmental research which may be less well represented here than in other countries. It is very doubtful, however, whether translations should be

limited to publications in the Russian language. There appears to be a tendency on the one hand to overemphasize the product of the Russian scientific press in this program, and on the other, to overestimate the extent of language knowledge among American scientists, especially in German and French. There is no question about the correctness of the assumption that German and French are much more widely understood by American scientists than is Russian. But one needs study only cursorily the statistics of library use to reach the conclusion that Russian is not the only foreign language that is little read in comparison with English. Other languages than Russian should be included in the program; and, in this connection we should not overlook the more important publications appearing in Japanese and Chinese.

Another aspect of translation service is that of facilitating the availability of distribution of the large and increasing number of individual foreign papers which are being translated by hundreds of agencies all over this country and in other English-speaking countries. A pioneer program in this field was initiated in 1953 by the Special Libraries Association. After experimenting for several years with voluntary work in development of a national "pool" of translations, the association, on July 1, 1953, established a Translation Center at the John Crerar Library through a contract with that library to administer the center. Close cooperation was established with the center for translations from Russian which was developing at the Library of Congress, the field being divided to avoid duplication of effort. The Library of Congress concentrated on Russian sources and the Special Libraries Association Center covered translations from all other languages.

On January 1, 1957, the Library of Congress transferred its collection to the Special Libraries Association Center at Crerar Library to aid in producing one national center for translations. Library of Congress discontinued its "Bibliography of Translations from Russian Scientific and Technical Literature"; and the Special Libraries Association Center's publication, Translation Monthly, began to list all translations added currently to the combined collection. At the present time this collection includes more than 25,000 translations from scientific papers from many foreign languages.

In the summer of 1958, with funds provided by Congress especially for this purpose, the Office of Technical Services of the Department of Commerce, established another center for translations under Government auspices. As part of its program, it projected a new publication to begin in January 1959, under the title, "Technical Translations." [3] Again with the purpose of avoiding duplication of effort, Special Libraries Association discontinued its Translation Monthly, with the expectation that the announcement function would be served by the new publication. Unhappily, this expectation has not yet materialized, with the result that there has been definite deterioration in the effectiveness of this important aspect of the service. It is hoped, of course, that the new Government center, with several times the amount of money that was ever available to the SLA Translation Center, will soon be able to bring its announcement program abreast of current accessions. This is an instance of a Government agency

[3] Ten issues, beginning in January 1959, have been released to date of hearing.

taking over a function previously performed by a private agency, the reverse of publicly expressed congressional preference. The comparative quality and costs should be examined.

In this connection, it should be recorded for the information of the committee that funds for the SLA Center have come from several sources, including grants from the National Science Foundation, the National Institutes of Health, and private organizations, and from subscriptions to Translation Monthly, and service fees charged for loan of translations or for copies produced by the photocopying service of Crerar Library.

In closing these remarks, I would like to thank the committee for giving me the opportunity to comment on a few of the problems in the field of scientific information. It should not be implied that the problems to which I have addressed my remarks are the only ones. They are simply the problems about which I have the broadest first-hand knowledge. And I should add that I have spoken very briefly on each of these points.

I would be very glad to attempt to answer any questions the committee wishes to ask or to elaborate on certain of the points that I think are more important.

The CHAIRMAN. Thank you very much, Mr. Henkle.

We appreciate your fine statement.

Do I understand from your statement, however, that the Library of Congress no longer translates and that all of that translation is deposited in the SLA?

Mr. HENKLE. The Library of Congress, as far as I know, has never had a translating service.

Dr. MUMFORD. May I comment on that?

I realize, Mr. Chairman, it gets confusing in referring to abstracting and translating at the same time.

Our primary program is abstracting, but in the course of that, as I mentioned in this statement, we have prepared over 8,000 translations of abstracts.

Now, the thing that we turned over to Mr. Henkle was a bibliography, a list of translations, not translations, themselves.

The CHAIRMAN. Well, as I understand Mr. Henkle's statement, though, the SLA now does the translating. Is that right?

Mr. HENKLE. No, this center does not do translating. Its function is this:

As I say in my statement, there are a large number of agencies all over the country, Government agencies, research institutes, and a great many companies that invest substantial sums of money in the translating of individual scientific papers. I have no statistics to indicate what the average cost is, but it certainly ranges in the order $50 to $100 on the average for each article translated.

The purpose the Special Libraries Association had in mind in establishing its center was to develop a procurement program for obtaining deposit of single copies of every translation produced, wherever they could be found.

A substantial number of Government agencies and a great many companies and private institutions have been depositing single copies of translations.

The CHAIRMAN. In other words, you would have available a copy of each Russian scientific document that is available in the United States?

Mr. HENKLE. Any that we have been able to get hold of.

At the present time, of the 25,000 translations in the center's collection, about 40 percent of them are from Russian scientific papers.

The CHAIRMAN. You say in your paper more than 60 of the important scientific and technical journals published in Russia originally have been translated, but you also say that a great many more remain to be translated and that this number is increasing.

About what percentage of the work have you covered?

Mr. HENKLE. That I am not prepared to state in terms of figures.

In general principle, however, it does seem fairly obvious that 60 journals from the total Russian output is far from covering the more important scientific journals in Russia.

Now, there have been questions raised, and I expressed it in my statement here, as to the point that we may reach fairly soon—a state where we should not attempt cover-to-cover translations of every word in journals in Russian or other languages, but rather do this translating selectively. This I think is a judgment which has to be expressed by the specialists in the fields of journals published.

If it is a mathematical journal, then I think mathematicians who know the language should be able to say, "Only the principal articles in this journal need to be translated. The rest of the material need not be."

The CHAIRMAN. You may find an American article translated into Russian. You wouldn't want to translate it back, certainly.

Mr. HENKLE. That is right.

The CHAIRMAN. All you might do is to make a note that this sort of article from the English language, American publication, is being translated into Russian, which would show the Russian knowledge of that fact.

Mr. HENKLE. That is right, an abstract, or perhaps no more than just a note.

The CHAIRMAN. Tell me this:

You referred, too, to the need of translating important publications appearing in Japanese and Chinese.

How much technical information, scientific information, would we get out of the Chinese, for instance?

Mr. HENKLE. The inclusion here of Chinese along with Japanese is based on my part largely on hearsay. I hear remarks from time to time that there is a very substantial increase in the amount of publication in China. We have been unable so far to get very much of this material into our library. I think we have two or three Chinese language periodicals.

On the other hand, in the field of Japanese we receive currently some 200 or 225, many of which are extremely important journals in the fundamental sciences, medicine, engineering, other fields, where the contributions made to American scientific informational fields may, in many cases, be equally important with the contribution from Russian, French, German, other sources.

Mr. MILLER. Would you yield?

The CHAIRMAN. I yield.

Mr. MILLER. The very fact, Doctor, that the Japanese today are producing perhaps the best cameras in the world and are well up in front in the field of electronics would indicate that they must have done a lot of research and must have had a lot of information in the

field of light and in the field of electronics that would appear in their publications. That would be of value, isn't that true?

Mr. HENKLE. From the use of Japanese literature, the occasions do not occur often but when they do, apparently with considerable importance, I would say that there must be a very substantial amount of Japanese literature which deserves translation. The problem here is even more serious than it is with Russian, because in the case of the Russian language it is relatively easy to transliterate the language, and to ascertain through just the common terms the general content or subject matter which is covered by the article.

In the case of Japanese, however, you either read it or you don't. There is no way of getting a middle-way interpretation from which you will know whether you need the journal.

The CHAIRMAN. Is there much work coming from Chinese societies?

Mr. HENKLE. That I don't know.

The CHAIRMAN. Haven't we done enough of it to know whether they are able to bring forth new ideas or new discoveries?

Mr. HENKLE. This is a question that I would be inclined to put to whatever representative of the National Science Foundation you may consult, because I expect that they are certainly inquiring into this.

The CHAIRMAN. Dr. Mumford wants to make a statement.

Dr. MUMFORD. Mr. Chairman, from representations made to us by other agencies of the Government, it is very desirable to have an index of Chinese scientific material comparable to what we are doing in our Russian index. This has been discussed with representatives of a number of agencies.

I can't speak with any detail about the volume of material, but it is felt that it is sufficient to warrant the same kind of index.

The CHAIRMAN. Of course we have no counterpart funds in China, and we would have to put up our money for that.

Mr. MILLER. Well, you could get it out of Formosa very easily.

The CHAIRMAN. That is a thought.

Are there any questions?

Mr. Quigley.

Mr. QUIGLEY. Mr. Chairman, I have two questions.

Doctor, you made reference to having something like 200 plus Japanese periodicals.

Do I gather that you actually have these in the original Japanese in your library?

Mr. HENKLE. That is correct.

Mr. QUIGLEY. You have no system for translating these publications?

Mr. HENKLE. We have contact with a number of individuals in the area of Chicago, and if a company comes in and wishes to have a particular article translated, then we can make arrangements to have it done for them.

The way in which they learn about them is this: Chemical abstracts in particular, attempts to abstract all of the literature of chemistry, in whatever country it is published.

We recently noted in a Japanese chemical industry journal a list of Japanese periodicals which are being currently indexed in chemical abstracts. It was all in the Japanese characters, so we couldn't read it, but it had a list of some 400 titles, so I had the list trans-

lated, and in cooperation with the Librarian of Chemical Abstracts we are checking to see how well represented these 400 titles are in the United States insofar as the Chemical Abstract records are concerned.

He also is checking to verify for me the accuracy of the inclusion in this list of the Japanese titles.

I referred here to an effort which has been made in the Middle West to try to get into the area, either in the Midwest Inter-Library Center or in one of the 20 cooperating research libraries of which Crerar Library is one, at least one copy, at least one current subscription to every periodical indexed by Chemical Abstracts, which numbers now between 6,000 and 7,000 titles.

Mr. QUIGLEY. And these would be in a great variety of languages?

Mr. HENKLE. All of the languages in which the literature of chemistry appears.

Mr. QUIGLEY. This is a project you are undertaking aside from anything you have in the way of actual translations?

Mr. HENKLE. That is correct. These are the original journals.

Mr. QUIGLEY. So that if any scientist was interested in a particular article, you might have that in the original Japanese or the original Russian or the original French? You might also have it translated?

Mr. HENKLE. That is right.

These articles, of course, are found through the indexing and abstracting tools, which accents the importance of this particular type of service, and occasionally the obtaining of one becomes really very important.

Just one use may be very important. One Saturday morning this last winter, as an illustration, I happened to be in the office, and the teletype bell rang. All I know how to do is turn it on, but I thought somebody needed something quickly, so I turned it on, and they pecked out a request for an issue of a Japanese chemistry journal for which they said they had urgent need, could we get them a copy by Monday morning.

I hunt and pecked out a reply that I would check and let them know. I checked. We had it.

We always operate our photocopying service on laboratories to handle rush orders. The boys photographed it and put it into the mail, and the chemical company in St. Louis had the article on Monday morning.

Now, presumably they had someone available who could read it, but they had to have the original article.

Mr. QUIGLEY. They needed the original?

Mr. HENKLE. They didn't say they wanted the original. They said, "We have urgent need for this article."

Mr. QUIGLEY. All right now, a second line of questioning has to do with your translation services.

I assume that you have feelers out to alert as many different possible sources in this country that you would like to have a copy of each translation made?

Mr. HENKLE. The Special Libraries Association makes special effort to publicize this program. In the initial period there was some reticence expressed from time to time from some companies. They would say, "Well, we just spent $200 for this translation; why should we give it away, so that other people can have it for the dollar and a half or the $3 that it costs to make a photocopy?"

The background or the support of that request is that while they have access to your translation at a very nominal figure, you in turn have access to their translations at the same nominal figure.

Mr. QUIGLEY. Now, my question is this: Do your efforts in this direction go beyond the continental limits of the United States? Do you get publications that perhaps would be translated in England?

Mr. HENKLE. We are getting quite a number of translations in microfilm copy from Australia and England. The coverage, I am sure, is only partial, but we are getting microfilm copies of translations, and those are listed in our catalog and photocopies can be provided to anyone who requests them.

Mr. QUIGLEY. Well, now, do you get those from libraries in Australia and England or do you get them from private companies who make the effort, the same as an American businessman might?

Mr. HENKLE. The Australian ones come from the Australian scientific mission here in Washington, as do the British. They come from the scientific missions located here in Washington. They are sent here, and then they send them to us.

Mr. QUIGLEY. Would either or both of these sources be a possible solution to the dilemma on Chinese publications?

Mr. HENKLE. That I can't speak to.

Mr. QUIGLEY. They would have more ready access to them, I suppose, than we would.

Mr. HENKLE. I don't know the answer to that.

Mr. QUIGLEY. That is all.

Mr. MILLER. Mr. Henkle, you speak of the Special Libraries Association. I assume that this is a group of libraries that work together in this field?

Mr. HENKLE. The Special Libraries Association membership is made up primarily of the librarians of industrial and other specialized sublibraries, covering a wide range of subject matter.

The division of the association which is interested in science and technology, is by far the largest division, but there are other divisions in the field of business and economics.

Mr. MILLER. Are any university libraries affiliated with you?

Mr. HENKLE. Individual staff members of many university libraries.

Mr. MILLER. But not the libraries, themselves?

Mr. HENKLE. No, for the most part there is not institutional membership.

Mr. MILLER. For the most part these are libraries of commercial institutions?

Mr. HENKLE. Well, there is a substantial membership in SLA of persons from the Library of Congress, and such places as the John Crerar Library, who are interested in particular subject areas.

The CHAIRMAN. Thank you very much, Mr. Henkle.

Mr. DADDARIO. In the last paragraph of page 4, you referred to 60 of the important Russian scientific and technical journals.

You said, however, there is need for greatly increasing amount of translations of journals.

Taking into consideration the important journals, the type of activity you need to cover the whole area, how many more would you say would bring you up to the point that you say you feel you would be doing a job that would be the ultimate to meet the needs?

Mr. HENKLE. I can't give you a specific answer in numbers. However, I think the John Crerar Library is possibly the most extensive and best west of the Alleghenies or west of the Atlantic seaboard. Still, we have to be selective, because that 10,000 figure we receive doesn't include more than a third of what is being published in the world today. We have to be selective so we make our selection on the basis of examination of sample titles wherever we can. The titles for which we subscribe are titles which in the opinion of our staff members are substantial journals.

Now, in Russian at the present time we are getting I think about 120 journals. I suspect that a substantial portion or all of those 120 deserves translating, but that is a "guesstimate."

Mr. DADDARIO. Well, even here, in the United States, of those scientific journals which are published, no one person could really read all of them. He would have to be selective in order to keep himself informed. You would probably use that same criterion as to the 120 journals you are talking about. So 60 at the moment would be a fairly representative job in that area, wouldn't it, 50 percent of the journals?

Mr. HENKLE. I am not sure that the 60 isn't behind the times.

Mr. O'Dette, who is here from the National Science Foundation, could probably tell me.

Mr. O'DETTE. It is not far off; maybe 65.

Mr. HENKLE. Sixty was the last number I heard.

May I comment on your point as to the selection and the ability of a scientist to read more than 60 journals, which I get is the implication of your question?

I doubt whether there is anyone that reads all of these 60 journals. The selection which, by and large, determines what material is read, comes through two channels: One, the scientists' current scanning of journals to see what articles have appeared that are of interest to him at that time, which may mean that he looks to scores of journals for every article he reads, so his reading currently is selective.

But further than that, his reading is made selective by virtue of the fact that when he is doing a piece of research and then systematically attempts to ascertain what has been published in his field, the indexing and abstracting journals lead him to wherever it has been published, and he is led frequently to the literature published abroad, and in other languages than English.

Mr. DADDARIO. That is exactly why I ask that question.

Mr. HENKLE. The articles of interest to him may be scattered through hundreds of journals.

Mr. DADDARIO. Yes. That is why I pointed the question in that direction.

If you do have a good broad base within those important journals which are published, they will then lead you to other places, and therefore you have a good start in this particular area.

Mr. HENKLE. That is right.

Mr. DADDARIO. Something Mr. Quigley and the chairman touched on in reference to Chinese journals.

Don't you find that there are more and more references within the Russian journals of scientific papers coming from China?

Mr. HENKLE. I think that an increasing number of references in the Russian bibliographies to Chinese publications is one important indication of increased scientific publications in that country.

Mr. DADDARIO. Wouldn't this indicate that we do have a problem in this field and we should be doing more in that area?

Mr. HENKLE. I think so.

The only title that I can recall at the moment that we receive is the Chinese Journal of Physiology, and that has been an important basic scientific journal for many many years.

Mr. DADDARIO. Thank you.

Mr. MCDONOUGH. Mr. Chairman.

The CHAIRMAN. Mr. McDonough.

Mr. MCDONOUGH. Mr. Henkle, is there any indication recently of an increase in the demand for this material, and in what branches of science have you noted it?

Mr. HENKLE. To which material do you refer?

Mr. MCDONOUGH. You have a broad scientific field of work here. In what branches of science has the demand for translations come more recently?

Mr. HENKLE. I think I would have to say all fields.

Mr. MCDONOUGH. You mean it has increased in all fields of science?

Mr. HENKLE. Physics, chemistry, biology, mathematics. We receive many requests, just general inquires: "Do you have in the center's collection a translation of:" and then a list of one or several papers.

We check the catalog, and more often than not we do not have the paper, so that there is a far greater need than is now being supplied.

Mr. MCDONOUGH. I mean to say, has there been an increase in requests for translations recently?

Mr. HENKLE. Yes.

Of course, the existence of the center, itself, stimulates these inquiries. Whether that increase in requests represents an increase of need, I can't say. It may represent an increase of knowledge of the center.

The CHAIRMAN. Thank you very much, Doctor.

Mr. WOLF. Mr. Chairman.

The CHAIRMAN. Mr. Wolf.

Mr. WOLF. I just wanted to make a short statement.

When I visited Russia in 1957, I had occasion to have as my interpreter a very charming lady about 32 years of age, and with her was a friend about the same age, both of whom were spending their entire time, except for about 4 days they spent in Moscow, in this business of translating scientific documents. They had with them a postcard showing the building in which they operated in Minsk, Russia. It was a tremendous building and the entire building was devoted to this business of translation, not only in the scientific field but in many other fields as well.

I thought that that was an interesting sidelight to add at this point.

The CHAIRMAN. Mr. Miller wanted to ask you a question.

Mr. MILLER. No, I was just going to make this observation.

The New Reader has published a series of six articles on China. They are very good.

Dr. Judd has put one of them into the record. The last article, written by a Chinese professor at the University of Taipei, among other things stressed the amount of research work being done in China, the work they are doing, the students they are educating, and the fact that there was a lot of scientific literature now being

published in China. Whether it is top-flight or not is something for the scientists to determine, but with that base, it certainly will not be long before they will be making substantial contributions in the field of science.

Mr. HENKLE. Just as one supplementary remark in that connection, the real basis for my suspecting that we must watch for Chinese publications is the reports that there is a great increase in the attention being given by the Chinese Government to the establishment of research institutes, and just as soon as you establish a research institute, you start having publications.

Mr. MILLER. That is one of the very things that this man points out.

The CHAIRMAN. Thank you very much, Doctor.

Mr. HENKLE. Thank you.

The CHAIRMAN. Mr. Foster E. Mohrhardt, Director of the United States Department of Agriculture Library.

We are glad to have you, Mr. Mohrhardt. I notice you have a prepared statement.

Mr. MOHRHARDT. Yes, sir. Mr. Chairman, I may add a few things to my statement because there have been several items raised, particularly one on the Chinese publications that I may be competent to speak about, and I would like to include them, if I may.

The CHAIRMAN. All right. Mr. Mohrhardt, would you give that as a prelude to your statement and let me say this: It is a quarter to 12 now. Let me suggest that the members not interrupt you until you finish your statement and then if we can go overtime we will be glad to do it. If we have to adjourn, at least we will have your full statement.

STATEMENT OF FOSTER E. MOHRHARDT, DIRECTOR, U.S. DEPARTMENT OF AGRICULTURE LIBRARY (NATIONAL LIBRARY OF AGRICULTURE)[4]

Mr. MOHRHARDT. Thank you, sir.

I am going to raise an aspect that concerns the acquisition of these Chinese publications that is I hope in order in this committee. It is a bit controversial.

We, like the Library of Congress, obtain a large amount of material through exchange. Fortunately we have the Department of Agriculture publications which we can exchange with foreign countries. Now we are handicapped in obtaining Chinese mainland publications because we do not recognize them diplomatically. This means that we cannot maintain exchange relationships. I am not being critical of this policy. I merely want to point it out to you as one of the

[4] Present position: Director, U.S. Department of Agriculture Library. Experience: Libraries—Michigan State University, New York Public, University of Michigan, Colorado State College of Education, Washington and Lee University, U.S. Veterans' Administration. Consultant, Brookhaven National Laboratory; Professor, Columbia University; Carnegie Corp. of New York, assistant to chairman, advisory committee, college and university libraries; U.S. Department of Commerce, Office of Technical Services. Education: Michigan State University, Columbia University, University of Munich, University of Michigan. Special activities: Member, Science Information Council (National Defense Education Act, 1958); member, Federal Advisory Committee on Scientific Information; board of directors: National Federation of Science Abstracting and Indexing Services; member, Biological Communicating Study Group (American Institute of Biological Sciences); adviser, Wildlife Disease, first scientific journal solely published in microform (Wildlife Disease Association); member, Committee on American Library Resources on Southern Asia of the Association for Asian Studies; president, United States Book Exchange; president, International Association of Agricultural Librians and Documentalists; U.S. representative: International Conference of Libraries and Documentation; U.S. delegate, Seminar on the International Exchange of Publications in the Indo-Pacific Area, Tokyo, Japan.

reasons that we in this country in our Government libraries are not as strong as we would be if we had access through exchange.

The CHAIRMAN. Let me interrupt simply to read a statement which our counsel has given me. He says that Mr. Conrad, president of the National Federation of Science Abstracting and Indexing Services, an association of private abstracting companies, will appear before the committee on Wednesday. He will speak of the availability of Japanese and Chinese scientific publications and his contacts with individuals in China.

I just wanted the members of the committee to have that information.

Mr. MOHRHARDT. We are very much interested in the publications in the field of agriculture from mainland China. We have identified 92 journals now being published there that we feel have some significance for our scientists. We are obtaining about 50 of them at the present time through purchase in Hong Kong. We do not have experts on our staff who can read Chinese.

However, we do know that in the field of botany the present publications coming out of mainland China are probably superior to any that have ever been issued in the history of China. I am stating this on the basis of an expert in the field. A 70-volume flora has been announced for publication, starting this year.

We know that in the field of the use of water and particularly in irrigation there is such significant material coming out that we are under constant inquiry from scientists in land-grant institutions to obtain these publications from mainland China.

These are only two areas. We know that they have put much effort into the fields of biology, microbiology, plant pathology, soils, and other phases of agriculture. The material being published in China is of such importance that we should be learning more about it than we are.

The Chinese Government has actually set up a new city in Lanchow that is devoted to the development of research, scientific research. It seems to me that our lack of knowledge of their scientific information is one of the most serious gaps that we have in the whole picture. There is no complete file in this country of the "Chuan Kuo hsin Shu Mu," their national bibliography.

May I also add one other comment. You were speaking earlier about the availability of information concerning foreign scientific publications. We issue a monthly bibliography of agriculture, which covers the entire range of materials in this field, and I have opened at random to a page in the field of forestry. We have listed here from the original publications current articles from Germany, Japan, Czechoslovakia, Russia, Finland, Sweden, France, Canada, Norway, Hungary, Poland, the Netherlands, and the United States, on one page of this journal.

The question was raised as to how scientists learn about these publications in foreign languages. This is one of the ways that they find out, through bibliographies.

Now would you like me to merely hit the high spots of my testimony?

The CHAIRMAN. Perhaps that would be the better way to handle it since we are limited as to time now.

Mr. MOHRHARDT. All right, sir.

Mr. Chairman and members of the committee, it is a privilege to represent the U.S. Department of Agriculture Library at these important hearings on the selecting, locating, assembling, indexing, abstracting, storing, retrieving, and dissemination of published scientific information.

ORGANIC ACT

Almost 100 years ago the Congress of the United States in the act of 1862 establishing the Department of Agriculture showed an awareness of the importance of scientific communication. It reads in part:

Be it enacted by the Senate and House of Representatives of the United States of America in Congress assembled, That there is hereby established at the seat of Government of the United States a Department of Agriculture, the general designs and duties of which shall be to acquire and to diffuse among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of the word * * *.

Section 3 of the act continues:

And be it further enacted, That it shall be the duty of the Commissioner of Agriculture to acquire and preserve in his department all information concerning agriculture which he can obtain by means of books and correspondence, and by practical and scientific experiments (accurate records of which experiments shall be kept in his office), by the collection of statistics, and by any other appropriate means within his power * * *.[5]

By 1876 the Department of Agriculture Library was considered the most complete on the continent in "agriculture and natural history, and their kindred branches of botany, geology, entomology, and chemistry."[6] Publications from every part of the world as well as complete collections of U.S. materials have been actively acquired by purchase, gift, and exchange.

SUBJECT FIELDS AND ACQUISITION

The Division of Chemistry, established in 1862, was the first research unit in the Department of Agriculture. Chemistry has been the underlying science for much of agricultural research. As a result, The Department of Agriculture Library during this period has assembled one of the world's most complete collections of books, reports, and journals in general and agricultural chemistry. Our collections are outstanding and unusually strong in the fields of botany, zoology, agricultural bacteriology, entomology, forestry, soils, agricultural engineering, veterinary medicine, and plant pathology. For publications prior to 1940, many of these collections are the most complete in existence.

We have been most fortunate in having available the publications of the Department of Agriculture for exchange with other countries. We have acquired, through exchange, thousands of publications which could not have been obtained in any other way.

A recent study of our collections shows that we are receiving currently 500 titles of journals and scientific reports being issued on a continuing basis from the U.S.S.R., 100 titles from Yugoslavia, and over 100 from Poland. In addition, we are receiving thousands of books, monographs, and other publications from those countries.

[5] An act to establish a Department of Agriculture. Approved May 15, 1862.
[6] U.S. Bureau of Education, Special Report 1876, pt. 1, p. 272.

PUBLIC NOTIFICATION AND USE

Acquiring this vast array of scientific publications is, of course, only the beginning of our job. We must then catalog, index, and make them available to the scientific public.

The current resources of the library are brought to the attention of scientists both within and without the Department of Agriculture through our monthly publication, the Bibliography of Agriculture. Evaluations of this publication have been made by various experts in documentation. Dean J. Shera, of Western Reserve University, and Prof. M. Egan state, "Some of the best comprehensive subject bibliographies in this country have been produced by special subject libraries of the Federal Government, such as the Department of Agriculture Library and the Library of the Surgeon General's Office".[7] Dr. M. Taube, president of Documentation, Inc., says, "The Government issues the Bibliography of Agriculture, the major bibliographical tool in this field".[8] It provides access through a subject arrangement to significant books, journal articles, and pamphlets in the entire field of agriculture and related sciences. It is used by individual scientists and major research installations, both in this country and abroad. In addition to this regularly issued bulletin, we also publish special bibliographies in subjects requested by Department research workers. At present, over 20,000 current journals and serials are received by our library and a published list of these titles is available.

The Bibliography of Agriculture carries a note each month indicating that copies of any articles listed in the publication may be obtained in photocopy or microfilm from the USDA Library.

PIONEER IN DOCUMENTATION

The pioneer effort in extending library services through photocopying of publications began in the USDA Library in 1934 in cooperation with the American Documentation Institute. From 1946 to 1956 the library had a joint arrangement with the American Chemical Society to provide chemists with photocopies of all articles listed in Chemical Abstracts. This resulted from the fact that we have one of the strongest chemical libraries in the world, which results from the importance of chemistry in agricultural research.

Holdings of this library are available to the general public through use in the building. Further availability for research workers is given through nationwide interlibrary loan and photocopy.

POLICY

The principal determinant in the policies of the Department of Agriculture Library is naturally the work of the Department itself. The Department's status as a national educational and research institution has shaped the character of the library, and for almost 100 years it has been considered as the national agricultural library.

[7] Science and Technology Act of 1958, hearings, pt. 1, p. 17.
[8] Science and Technology Act of 1958, hearings, pt. 1, p. 185.

NATIONAL LIBRARY COOPERATION

I have been asked to provide this committee with information concerning the origins and tradition of service as a national library and our cooperation with the Library of Congress and the National Library of Medicine.

Early evidence of the Department's recognition of national library responsibilities is shown in the Report of the Commissioner of Agriculture for the year 1871:

> The library continues to receive the journals and reports of the leading agricultural and scientific associations of the world, many of which are in exchange for the annual and monthly reports of the Department. * * * All of these works are carefully preserved, and in themselves form a useful collection for reference in the scientific and statistical investigations of the day. Many of them are probably not accessible in any other library in the country. They furnish the results of the very latest investigations in entomology, botany, agricultural geology, and microscopy, as well as experiments in agriculture.

I would like to add here that I subscribe to what Mr. Mumford said on page 11 of his testimony where he said that the role of the Library of Congress is supplemented and enhanced, rather than detracted from or weakened by, the two other great national library collections—those in agriculture and medicine—held by the Library of the Department of Agriculture and the National Library of Medicine.

And I would underline and subscribe to his statement about the continued harmony between these libraries. We have three unique collections and I think it would be impossible to build up or duplicate these collections today if you had unlimited funds. In view of this, it seems to me that these three libraries must be considered in any discussions or investigations you are going to make concerning national library service for the sciences.

EARLY CONGRESSIONAL HEARINGS

Various experts were asked to appear before the Joint Committee on the Library of the House of Representatives and of the Senate in 1896. Mr. W. I. Fletcher, representing the American Library Association, outlining the interrelationship of the three main Government libraries, said:

> On being summoned to appear before this committee, I made a few notes of things which seemed to me worthy of special consideration in connection with the national library at the present stage of its development. The matter which most prominently engaged my attention was the fact of the considerable number of departmental libraries here in Washington, and it seemed to me that the great national library of the future must consist rather of this whole series of libraries, than of the present Library of Congress, with any development that it may have—that is to say, that development should be made in full recognition of these other libraries. Merely as an example of what I mean, I would refer to the valuable Library of the Department of Agriculture, which is being made very strong in certain special lines, as forestry, biology, economic entomology, economic botany, etc. Now, it would seem unnecessary and impolite for the Library of Congress to duplicate the special collections. So with several other departments, notably the Surgeon General's Office, where there is already a library of nearly 200,000 volumes, not so strictly confined to medicine but that it is very strong in such subjects as public health and hygiene in general. * * *

INTERNATIONAL STATUS

By 1900 the library was generally regarded as a national one and the librarian of the USDA said in his annual report that year:

> As the most complete agricultural library of the world, it should be the mission of this library to place at the disposal of the various agricultural investigators of this country the reference works which they are unable to obtain from any other institution * * *

LIBRARY OF CONGRESS OUTLINES PLANS

Then in 1905 Dr. Herbert Putnam outlined the general pattern of responsibilities for the three national libraries. His annual report for that year states under the heading:

PROPOSED TRANSFER OF MATERIAL TO DEPARTMENTAL LIBRARIES

> Under the original agreement of 1866 all material received by the Smithsonian constituting its library was to be deposited in the Library of Congress, and preserved there. Included in such are a number of serials in departments of literature which form specialties of certain department or bureau libraries within the District, and are, for this reason in general, avoided by the Library of Congress. Particularly is this true of agriculture and of medicine. During a brief period prior to 1897 the medical serials received by the Smithsonian were, I understand, diverted to the library of the Surgeon General's Office. The purpose then was to save them from the hazards at the Capitol. I believe that a larger permanent policy should direct the resumption of this practice and its extension to at least one other department of literature—agriculture. There should perhaps be excepted (1) the publications of governments and of societies, and (2) a selected number of the most important journals, i.e., those which record the progress of these sciences in their larger aspects, especially, also, their progress within the United States, and those which contain the more scientific discussions of underlying theory and principle. Agriculture and medicine are special fields of literature. The libraries of the Agricultural Department and of the Surgeon General's Office have already large collections in them, the latter a preeminent collection. They are extremely efficient. They also are Government libraries, within the District, liberally administered. Efficiency, as well as economy, should dictate the concentration within them of highly specialized material within their special scope, and the avoidance of duplication of such material within the Library of Congress. I have recommended this view to the authorities of the Smithsonian.

Putnam elaborated on this idea in 1908, pointing out what he considered to be the proper relationship between the Library of Congress and other governmental libraries. Since the Library of Congress not only attempts to maintain a comprehensive general collection with supplemental special collections but also provides library guidance through cataloging, classification, and bibliographic service, he suggested that the other Government libraries should (1) limit their collections to their special fields of service; (2) interchange information with the Library of Congress concerning publications in their special fields; (3) recommend to the Library of Congress expensive material which could not be acquired by the individual library; and (4) utilize the work performed by the Library of Congress in classification, cataloging, et cetera.

Putnam's proposal helped shape the Department of Agriculture Library's procurement policy. Purchases were limited to subjects of special interest to the Department, and material of marginal interest was discarded. The Department's library has traditionally emphasized currently useful material, and little money has ever been spent on old, rare, or expensive items which were in the Library of Congress. This does not mean that the Department of Agriculture has no rare

or unusual items. Many books acquired in the last 100 years for current needs have now become rare, valuable, and unique. Rare agricultural publications have also been donated to the library. Others have been collected because of their importance in the development of the history of agriculture and those sciences most closely connected with this subject.

1947 PROPOSAL

As Mr. Henkle pointed out in his testimony on page 2, the Second World War disclosed there were serious gaps in the holdings of American libraries in publications issued abroad. It was partly as a result of the reexamination of these libraries that the Library of Congress Planning Committee, composed of scientists, scholars, and librarians, was formed and I believe the report of this committee is as pertinent today as it was in 1947 when it was issued.

This report states:

> The purpose of a national library is to make the world's accumulation of useful knowledge available for national needs.
>
> I. The committee recommends that the Congressional Joint Committee on the Library ask Congress to:
>
> A. Recognize the resolution that the Library of Congress is in fact the National Library of the United States. * * *
>
> B. Recognize the Army Medical Library and the Library of the Department of Agriculture as libraries giving national service in a special field.
>
> Federal libraries other than the Library of Congress fall into two general categories. The first and most common of these will be termed in this report "agency libraries." An agency library includes primarily material in fairly steady use by the staff of the agency which it serves.
>
> The second type of Federal library is one which has a comprehensive collection in a special field, and gives national service in that field. The Army Medical Library and the Library of the Department of Agriculture fall into this group, and it is recommended that they be officially recognized by the Congress as libraries giving national service in a special field. * * *
>
> * * * It is of great importance to the security of the United States and to research workers that there should exist in Washington an outstanding and coordinated collection of science and technology which would include material from every part of the world, and would cover all branches of science and technology broadly interpreted, with the exception of medicine which should continue to be the responsibility of the Army Medical Library, and agriculture, which is the responsibility of the Library of the Department of Agriculture, and such other branches of science and technology as may be assigned to libraries giving national service in a special field in accordance with procedures described above.[9]

PRESENT STATUS OF USDA LIBRARY

I have also been asked to present an evaluation of the performance of our library in meeting the problems of increased worldwide scientific publications, indexing, abstracting, bibliography preparation, and translation work.

Our library shelves contain over a million tightly packed volumes, overflowing to the floors. We are faced with a continually increasing output of publications in our fields. The number of journals in agriculture, botany, chemistry, and zoology is doubling every 10 years.

During the past 10 years while this load of publications has been mounting it has been necessary to decrease our staff 33⅓ percent in order to provide for the absorption of pay raise costs and the increase in costs of books, magazines, and other items purchased. We have

[9] Library of Congress Annual Report, 1947, pp. 102-108.

partially offset the reduction in personnel by mechanization, shortcuts, simplification, and management improvements.

We hope to begin a major weeding, inventory and binding program in the near future.

Although the number of significant publications constantly increases, we now bind only half as many volumes as we did 10 years ago. Binding arrearages have reached a critical stage, particularly in view of the dependence of workers throughout the Nation on us for permanent files of publications in agriculture and allied sciences. Scientists in the Department, in land-grant institutions and in industries concerned with agriculture look to us for the world's publications in these fields. A recent spot check of library users showed that in addition to Government workers, professors, veterinarians, agriculturists, botanists, geographers, and agricultural associations, there continues to be heavy use by industry. Food processing firms, pharmaceutical companies, machinery manufacturers, chemical plants—practically every segment of American industry relies upon us for recent printed publications. We acquire publications for specific agricultural needs but we make them available to workers in related fields in every part of the country.

An estimate of the value of the USDA Library was indicated in a statement recently made by Dr. Byron T. Shaw, Administrator, Agricultural Research Service, before the House Subcommittee on Manpower Utilization:

> Next to the scientist himself the library is most important in research. It is most important that scientists have available what has been done by others or we will waste a lot of money.

May I just add two other points. First, that we in the Department are waiting patiently for results from the use of the Public Law 480 funds both for translations and acquisitions of publications.

Mr. WOLF. Mr. Chairman, may I interrupt for a minute to ask which House Manpower Utilization Subcommittee there. There are now two or three.

Mr. MOHRHARDT. This was the committee of which Representative Davis is chairman. Does that identify it? I think it was about 2 months ago.

Mr. WOLF. Yes. I did not mean to interrupt you.

Mr. MOHRHARDT. We too are tremendously interested in the results of the Public Law 480 translation program. We have constant requests not only from people within the Department but from research workers in the land-grant institutions whom we serve, scientists throughout the country who are specifying needs from Japanese, Chinese, as well as from the Russian and the other Slavik languages, and we certainly are interested in any support that you can give to that program.

The CHAIRMAN. Well, let me ask you a question now, because you are about finished with your statement. Do we have ample funds that could be used for those programs abroad from the agricultural sources?

Mr. MOHRHARDT. I am sure this will be taken up in the testimony of the National Science Foundation, but it is my impression that we certainly have ample funds to begin the translation program and to assess the value to us of such a program. There are funds available

that are not being used for other purposes that could be used very effectively for translations.

The CHAIRMAN. Is it the recommendation of your Office that we utilize those funds?

Mr. MOHRHARDT. It is the recommendation of my Office, the Office of the Librarian; yes.

The CHAIRMAN. So it is the recommendation of the Department also. The problem is with the Bureau of the Budget.

Mr. MOHRHARDT. May I refrain from commenting there.

The CHAIRMAN. Of course we do not want to get you into any trouble at all. Mr. Wolf has a question he wants to ask.

Mr. WOLF. Well, I understand that you want these Public Law 480 soft currency funds for translating services in other countries?

Mr. MOHRHARDT. Yes. We have no translation program in our library. We are completely dependent upon whatever may be done under the Public Law 480 program.

Mr. WOLF. Is this strictly because of the fact that no new moneys have been appropriated or no additional moneys. Is that why you have reduced your personnel by one-third?

Mr. MOHRHARDT. Partially due to increasing costs. Our budget just has not kept pace.

Mr. WOLF. Do you need more money?

Mr. MOHRHARDT. Well, again——

Mr. WOLF. All right, take it off the record.

Mr. MOHRHARDT. I have made my appearance before the House and Senate Appropriation Committees and I have asked for more money.

Then I would just like to mention one other thing. Within this tripartite arrangement we have in our national libraries, and the cooperation we have had for 100 years, there are still gaps because of the increasing quantities of scientific literature. We three are all doing a job of operating libraries and we need an agency like the Office of Scientific Information of the National Science Foundation where they can look at these problems in a broad way and help us in our planning and provide guidance.

I am greatly impressed by the work done by the National Science Foundation.

Mr. MILLER. That is one of the most significant statements made this morning, Mr. Chairman.

The CHAIRMAN. How much money did you ask the Appropriations Committee for?

Mr. MOHRHARDT. The total amount was about $100,000, including the amount for the pay raise, the increase this year.

The CHAIRMAN. A hundred thousand dollars would do this job like you think it should be done?

Mr. MOHRHARDT. No, sir.

The CHAIRMAN. Well, what would it take?

Mr. MOHRHARDT. The $100,000 we are requesting is to provide us with funds for an inventory and weeding and binding program in our library. In other words, to go through the stacks, clean out materials we do not need, provide an inventory that we just have not had in 20 years.

Mr. MILLER. Get rid of the dead material?

Mr. MOHRHARDT. Yes.

The CHAIRMAN. That would just begin to launch you on your program, after you get rid of all of the dead timber?

Mr. MOHRHARDT. Yes, sir.

The CHAIRMAN. So you need a good deal more than a hundred thousand dollars then?

Mr. MOHRHARDT. Yes, sir.

The CHAIRMAN. Now let me say one thing more.

I am familiar with the Medical Library which was under the jurisdiction of the Army, because I remember when we passed the bill to authorize the transfer. The collection of scientific material in that library is irreplaceable. It comes down through the ages. Do you have a cooperative agreement with the Medical Library and the Library of Congress to work together?

Mr. MOHRHARDT. Very definitely. If I might give an example, about 2 years ago Colonel Rogers, who is the head of the National Library of Medicine, said, "We no longer are interested in collecting veterinary medical materials, we do not have many veterinarians in the defense agencies any more. It is still of interest to you. Will you take over the complete responsibility so we can put our efforts to other fields." As a result of this we now are doing our best to carry out the full responsibility for extensive collection in the field of veterinary medicine. This is frankly the kind of cooperation we have. We have also asked them to relieve us of borderline medical materials. There are diseases that affect both animals and humans and there is a borderline area of publications, so that we both are interested in medical material but we try to rely more and more on them for medical publications and they on their part rely on us for our special fields of interest, such as entomology.

Mr. MILLER. Mr. Chairman.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. While we have three outstanding librarians here I would like to ask this: What cooperative arrangement is made with libraries outside Washington? I am going to make a statement that I know will be challenged by 49 other States, and I am not going to argue with them, but we are very proud of our State Library in California.

Now is there any cooperation between the libraries—and I am asking this question of Dr. Mumford, Mr. Henkle, and Mr. Mohrhardt.

Mr. HENKLE. May I speak to that, Mr. Miller? I would say in support of the principal national libraries here in Washington, that without them the research libraries throughout the country would really be at a serious loss for a long time to come before they could make up the gaps in the areas for which they now depend on these libraries.

We have the largest medical library west of the Atlantic seaboard, but it is only about 20 percent—it is less than 20 percent, perhaps about 15 percent as large as the National Library of Medicine—and the National Library of Medicine does not have all of the medical literature of the world—so you can see that is just one illustration and that would carry right through all of the Library of Congress, Department of Agriculture, and the National Library of Medicine resources. Without them, every other research library in the country would have a far greater problem of serving its clientele than it has today. We depend on them;

Mr. MILLER. Maybe Dr. Mumford would like to comment on that.

Dr. MUMFORD. Well, I would endorse and appreciate what Mr. Henkle has said. The Library of Congress tries to make known its resources through the National Union Catalog so that other institutions know what we have and the material is available on interloan to the institution or we can provide microfilm or photostats for individual items.

Mr. MOHRHARDT. May I add that it is a two-way street. We have research branches in Albany, Calif., and in New Orleans. We depend heavily for interlibrary loans on the University of California, and Tulane, and L.S.U., the universities nearby. So we benefit from them, as well as their benefiting from us.

Mr. QUIGLEY. Mr. Chairman.

The CHAIRMAN. Mr. Quigley.

Mr. QUIGLEY. I have just one question, Mr. Chairman, to follow up on Congressman Wolf's reference to the translation mill which he indicated was located in Minsk.

Now all three of you are librarians, and as librarians your first assignment is collection, you have got to get the books, you have got to index and catalog them and have them available, but I gather that none of you feel that your primary responsibility is in the field of translation.

My question is: Is there any agency or unit within our governmental setup or within our country that would serve as a small prototype, a nucleus of a translation mill which might be developed and encouraged and fostered by this committee or the Congress? If there isn't such a thing, should there be one?

Dr. MUMFORD. Mr. Chairman, I would like to make one or two observations on that. There is a great deal of material being translated, as has been indicated here this morning, on a decentralized basis. I think probably Mr. Mohrhardt and Dr. Henkle would agree with me that it is not desirable to translate everything, that it would be wasteful and useless, and our observations at the library growing out of the abstracting work that we are doing for the Department of Defense in particular is that it is better to be able to respond to a request for a translation when it is needed, an individual translation, than to contemplate translating everything cover to cover.

Mr. QUIGLEY. You would be more inclined to meet the need as it arises rather than try to anticipate every need?

Dr. MUMFORD. I would say so. These other two gentlemen perhaps have other ideas or would like to elaborate upon that.

Mr. HENKLE. I would concur in that observation. I would add that we are not in the translation business not because it is inappropriate to libraries, but because it is such an expensive operation that it would conflict seriously with our major responsibility.

I might add one other thing with respect to the indexing of sources of translations. The translation center—the S.L.A. Translation Center in addition to having an author catalog of papers translated and available through the center's collections, also has a journal index, which is not yet complete, through which we will be able to ascertain what proportions of any one journal have been translated. On the basis of this record, scientists advising whatever agency of the Government is responsible, probably the National Science Foundation, could then advise what additional material from any given journal might be translated in order to make more complete the important sources.

The CHAIRMAN. Thank you very much, Doctor; and I want to thank all three of you librarians for being here this morning. All of your statements are excellent, just exactly what the committee wants in the way of information, and we certainly commend you for your cooperation.

Mr. WOLF. Mr. Chairman.

The CHAIRMAN. Mr. Wolf.

Mr. WOLF. Could we have a short statement from each of them? They do not have to give it to us now, but I would like to have a biographic sketch on each one of them for the record.

The CHAIRMAN. We would be delighted to put that in the record if they will assist us in that respect.

Mr. HECHLER. Mr. Chairman, I think it would also be helpful for Dr. Mumford's case if there could be submitted for the record a brief statement on what the U.S.S.R. is doing in this field so that this would provide in a sense an incentive and challenge.

Dr. MUMFORD. We would be glad to undertake that. It is possible that the National Science Foundation could give a more detailed or comprehensive picture, but we will confer with them and do as you wish.

Mr. HECHLER. Both the Library of Congress and the National Science Foundation.

The CHAIRMAN. Mr. Wolf spoke about that.

Mr. HECHLER. Rather than relying on the post card Mr. Wolf saw, we should have more accurate information.

(The information requested is as follows:)

PROCUREMENT AND DISSEMINATION OF FOREIGN SCIENCE AND TECHNOLOGY PUBLICATIONS IN THE SOVIET UNION

I. PROCUREMENT AND EXCHANGES

In 1957, Soviet libraries reportedly received 500,000 copies of books from abroad. Many of these were received by exchanges with foreign libraries and institutions, some 70 libraries maintaining large-scale exchange programs. Among the leading Soviet libraries, the Lenin State Library in Moscow entertains exchanges with institutions in 60 countries and the Library of the U.S.S.R. Academy of Sciences conducts active exchanges with some 1,750 institutions in 82 countries.

In addition, Soviet libraries have engaged in substantial purchasing programs. The Lenin State Library in Moscow, for instance, purchases well over 40,000 foreign books per year, predominantly in science and technology. In 1957, the Soviet Union as a whole is said to have imported 89,414,000 rubles' worth of publications in all fields of knowledge (or $8,941,400 at the 10-to-1 ruble-dollar ratio), a figure is substantially more than the figure for exports, which amounted to 48,173,000 rubles.

The emphasis of these operations clearly focuses on scientific and technological literature, which in recent years has been procured in an ever-increasing volume. To demonstrate this point by way of example, of the 4,000 foreign periodicals and newspapers annually acquired by the Library of the U.S.S.R. Academy of Sciences, over three-fourths are in the fields of science and technology, and the more important foreign scientific journals and reviews are often secured in up to 20 copies. An estimated 40 to 50 percent of the holdings in the largest Soviet libraries specializing in science and technology consist of foreign materials and in some of these libraries about 30 percent of the readers' requests are for foreign scientific publications. The All-Union Library of Foreign Literature (Moscow), which serves as a storehouse for foreign literature in all fields of knowledge, has also shifted in past years the stress of its procurement operations to science materials. A list of foreign book titles acquired by larger Soviet libraries in science, technology, medicine, and agriculture for 1957 contains 21,654 titles, while those in the social sciences and related fields amounted to 20,367.

The present concentrated Soviet effort seeking to provide widest possible access to scientific and technological progress abroad is the result of systematic policies formulated in 1955 by the supreme organs of the Soviet Communist Party and Government. This development represents a radical departure from the official policies which were in effect during the Stalin era and which were designed to reduce the flow of information from the West, including scientific and technological data, to a mere trickle. The new course was inaugurated by a resolution passed in 1955 by the party's central committee, directing the country's leading industrial and scientific agencies to purchase foreign technical literature, to intensify the exchange of scientific and technical information with foreign countries, and to improve methods of technical documentation. The details of this program are spelled out in a decree promulgated in the same year by the U.S.S.R. Council of Ministers in the interest "of familiarizing [Soviet] scientists and engineers with foreign achievements in science and technology and of broadening the utilization of foreign patents and catalogs." In essence, this decree directed the U.S.S.R. Ministries of Culture, Higher Education, and Public Health to purchase two extra copies of all foreign scientific literature and to forward one set of this foreign literature to the Lenin State Library, and to divide the other set among the State Science Library, the State Central Medical Research Library, and the All-Union State Library of Foreign Literature. The Ministry of Foreign Trade was charged with the responsibility of securing important patent materials and trade catalogs of foreign firms and of organizing, with the help of the Soviet central agency for the export and import of publications (Mezhdunarodnaia kniga), an extensive information service for economic and industrial ministries regarding recent foreign publications and patents. In addition the U.S.S.R. Ministry of Higher Education was commissioned to supply systematically Soviet scientists and technicians with foreign scientific and technical literature from the collections of the State Science Library in Moscow.

It should also be pointed out that for the purpose of familiarizing Soviet scientists and engineers with new foreign publications a considerable number of major Soviet libraries of all types issue regularly for interested users detailed lists and catalogs of Soviet accessions of foreign science literature.

2. OTHER MEANS OF DISSEMINATION OF INFORMATION

The Soviet Union has undertaken various other steps to make foreign scientific information available to its own scientific workers.

Reproduction of foreign journals

A number of foreign journals are reproduced in their entirety through a photographic process by the All-Union Institute of Scientific and Technical Information in Moscow as individual issues are received. These journals are reported to total about 300 titles, and include ones published in English, French, and German. No figures are available as to the number of copies printed, but the annual catalog announcing these journals for subscription is issued in 100,000 copies. The reproduction of such journals saves foreign currency and is useful to Soviet scientists because many of them know the original languages.

Important scientific books are also sometimes reproduced by the same process.

Photoduplication services

Photostats or microfilms of individual articles published abroad are available from various Soviet libraries, institutions, and publishers. In particular, the All-Union Institute of Scientific and Technical Information provides a reproduction of any of the articles covered in its abstract journals.

Translations

The Soviet Union is further engaged in a translation program of foreign books. In 1957, some 125 titles in science, 374 in technology, 65 in agriculture and 13 in medicine were translated and printed in a total of 2,810,000 copies. The total translated from English in all these fields amounted to 252 titles in 1,863,000 copies.

A number of Soviet journals (usually monthly or bimonthly) are devoted to translations of articles, in full or in part, appearing in foreign scientific periodicals. One of the most important publications appears more frequently: the "Express Information" of the All-Union Institute of Scientific and Technical Information prints on separate sheets translations of selected articles in foreign journals and distributes them shortly after their receipt in the U.S.S.R.

Translations of individual articles are provided upon request by a number of Soviet agencies, among which are the All-Union Institute of Scientific and Technical Information, major Soviet libraries, and the All-Union Chamber of Commerce.

Abstract services

The largest single abstract service is provided by the All-Union Institute of Scientific and Technical Information, which, at present is publishing 13 abstract journals, each devoted to a particular field of science or technology. They cover: Astronomy and geodesy, biological chemistry, biology, chemistry, electrical engineering, geography, geology, geophysics, machine building, mathematics, mechanics, metallurgy, and physics. The number of abstracts appearing in these publications amounts to about 500,000 annually. The institute's staff totals 2,300 and makes use of the services of some 20,000 part-time abstractors. Still, many abstracts are published with considerable delays, and the general lack of subject indexes makes these abstract journals difficult to use.

The institute has estimated that its journals provide coverage of 70 to 80 percent of the world's literature in science and technology. In 1957, the institute was abstracting 1,873 scientific journals published in the United States.

Abstract services narrower in scope are provided by abstract journals published by other institutions and organizations such as, for example, the All-Union Research Institute of Automobile Transportation, the "Soviet Radio" Publishing House, etc. Fields covered include atomic energy, radio engineering, the construction industry, etc. One of the largest is that devoted to medicine, which appears in four series.

Mr. WOLF. I want to make a statement. I do not want to become a Mr. Mallan on this thing. I am not an authority on the subject because I was there a month, but I thought it was interesting that the interpreter I spoke of earlier was proud of the thousands of people who worked there and she made the statement: "Russia is a hundred years behind your country in these matters and we have to take the best you have had over the past hundred years and bring it up to date." I am not even suggesting that the building existed for that purpose, but this is what the lady said.

The CHAIRMAN. Thank you very much. There is no further business, but I want to say one thing.

Thursday, for the benefit of the members here we will have the seven astronauts and I suggest that the members will certainly want to be here to see them and talk with them.

What do we have for tomorrow?

Mr. DUCANDER. Tomorrow we have Mr. Huff from the Department of Defense and Dr. Rogers of the National Library of Medicine.

On Wednesday we have Mr. Conrad, president of the National Federation of Science Abstracting and Indexing Services; Mr. John Green from the Department of Commerce; Dr. Waterman, National Science Foundation.

The CHAIRMAN. If there is no objection, the committee is recessed until tomorrow morning at 10 o'clock.

(Whereupon, at 12:13 p.m., the committee was recessed, to reconvene at 10 a.m., Tuesday, May 26, 1959.)

DISSEMINATION OF SCIENTIFIC INFORMATION

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Tuesday, May 26, 1959.

The committee met, pursuant to recess, at 10:55 a.m., Hon. Overton Brooks, chairman of the committee, presiding.

The CHAIRMAN. Now, gentlemen of the committee, we have two more witnesses, Mr. Ben G. Huff, Director of Review and Services, Office of Director of Defense Research and Engineering, and we have Dr. Frank B. Rogers (lieutenant colonel, Medical Corps, U.S. Army), Director, National Library of Medicine.

First, we will hear from Mr. Ben G. Huff.

Before you begin, I have an announcement for the committee.

We have one bill here, H.R. 6288, by Mr. Anfuso, which would establish a National Order of Science to provide recognition for individuals who make outstanding contributions in science and medicine.

It does not yet have the approval of the Department, but apparently would cost a very small amount of money, and since that bill is in the shape where we could take it out, if there is no objection, I am going to set it down for hearing at a future date, probably toward the end of June. That is H.R. 6288.

We will get the witnesses and have the bill heard.

We have reviewed every bill that has been filed and sent to this committee, and this seems to be the only one we are in a position at this time to take up.

We don't have a report from the departments on the other bills that we have. We would want an expression from the Bureau of the Budget.

Now, there are one or two other matters that can be disposed of at this time.

The question has come up; a number of members of the committee have asked about travel after the adjournment of Congress.

The committee has no money available for foreign travel. Funds for domestic travel were provided by our investigative resolution.

Now, there might be a method worked out with the State Department for use of counterpart funds during foreign travel. There may be members of the committee who are interested in going overseas after the adjournment of Congress, for instance to see the Jodrell bank installation in England, some of the missile installations overseas, or an important scientific convention some time later on in England or in France—if there is such. I wish that the members who are interested would give their names to the staff of the committee.

I have prepared a short mimeographed statement on this subject which I am going to send to every member of the committee.

We are also without power to hold committee meetings overseas, and that is because the resolution which authorized our funds expressly provides, and it is the policy of the House too, that there not be any committee meetings overseas.

Now, there is no action to be taken on that at this time. I would be glad to have expressions of opinion from the members of the committee from time to time.

Mr. FULTON. Mr. Chairman.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. On that point, I would recommend that the committee staff prepare a resolution authorizing $25,000 for the use of the members for travel after the adjournment of Congress in addition to the counterpart funds that you spoke about, and secondly, that they be given whatever powers the usual committees of Congress are given with respect to this travel.

The CHAIRMAN. Well, they have the usual powers now that the committees of Congress have in reference to travel.

The Rules Committee made it a point this year of not giving any committee authority to hold meetings overseas or to use funds for foreign travel.

Mr. FULTON. I merely meant the usual resolution. There are certain provisions as to travel, and we should have the usual provisions in the resolution.

The CHAIRMAN. You mean change the resolution?

Mr. FULTON. Well, we adopt the resolution and make the amount of $25,000 available. I would recommend that we take it up with the majority leader before we take action on it.

The CHAIRMAN. There is no rush for the action.

My point in bringing it up at this point is simply to let the members begin to think about it.

Mr. MILLER. We are not restricted as to counterpart funds, are we?

The CHAIRMAN. Well, I think it would be better to discuss that in executive session. We have witnesses here. So why not let the matter rock along for a couple of weeks.

I would like to say at this time that we do not plan a meeting of the committee tomorrow in deference to and in respect for Mr. Dulles.

Thursday the seven astronauts will be here. I think that most everybody will wish to be present for that.

Mr. HECHLER. Mr. Chairman, are the astronauts going to testify?

The CHAIRMAN. You will have an opportunity to talk to them informally and to meet them. I think that is the purpose.

They will go up to the Senate the following day.

Mr. MILLER. Mr. Chairman, I asked Mr. Ducander to contact the Bureau of Standards. I don't know what arrangements he made, but I was planning on Friday to take Subcommittee No. 1 to the Bureau of Standards.

The CHAIRMAN. There will be no meeting of the full committee Friday, and any subcommittees that wish to hold sessions may do so.

Mr. MILLER. We will just go out and take a look at the physical properties.

The CHAIRMAN. I think that is an excellent idea.

Now, Mr. Huff, would you give us just a little bit of your background, and then we will be delighted to have your prepared statement.

Mr. HUFF. Yes, sir.

STATEMENT OF MR. BEN G. HUFF, DIRECTOR OF REVIEW AND SERVICES, OFFICE OF THE DIRECTOR, DEFENSE RESEARCH AND ENGINEERING, OSD.

Mr. HUFF. I have attached to my statement a brief background statement.

I was born in Iowa in 1911, educated in the public schools and at the University of Omaha, obtaining an A.B. degree there in 1933.

I taught school a couple of years in Blair, Nebr., and then I have been with the Federal Government since 1935.

The last 11 years I have been in the Office of the Secretary of Defense.

In 1953 I became a Special Assistant to Mr. Newbury, who was then the Assistant Secretary of Defense for Engineering, and when the offices of the Assistant Secretaries for Engineering and Research and Development were combined, I became Director of the Office of Review and Services, and have continued in this capacity in the newly created Office of the Director of Defense Research and Engineering.

Mr. WOLF. For the chairman's benefit, would you state again where you were born?

Mr. HUFF. In Iowa, sir.

The CHAIRMAN. Now, you have a prepared statement. You may proceed.

Mr. HUFF. Mr. Chairman and members of the committee, I appreciate this opportunity to meet with you and to discuss the responsibilities of the Office of the Director of Defense, Research and Engineering for technical information matters in the Department of Defense, particularly the activities of the Armed Services Technical Information Agency (ASTIA). The Director, Dr. York, regrets that he was unable to appear personally to make this presentation.

Incidentally, Mr. Chairman, he instructed me to say to you if you want to hear from him at any time in the future on this subject, he will be glad to appear.

The Office of the Director of Defense, Research and Engineering and its predecessors, the Office of the Assistant Secretary of Defense, Research and Engineering, and the Research and Development Board, have always been interested and concerned with the collection, dissemination, and use of technical information.

In 1948, the Research and Development Board chartered a Committee on Technical Information. The principal act of this committee was to establish the Armed Services Technical Information Agency (ASTIA) in 1951 by consolidating the activities of the Navy at the Library of Congress, known as the Navy Research Section, and a similar Air Force operation at Dayton, Ohio, known as the Central Air Documents Office (CADO).

The Secretary of Defense issued a directive in May 1951 establishing ASTIA to provide a central service for the collection of technical information from the three services and the dissemination of this

information to Department of Defense laboratories and Defense research and development contractors. The Air Force was appointed as the executive agent to supervise and operate the Agency. The policies for the operation of ASTIA are established by the Director of Defense Research and Engineering, and on these matters I am the chief staff assistant.

Originally, the operation was financed by equal contributions from the three services, but in 1955 the Air Force was directed to finance the Agency as an overceiling item. In recent years, the cost of the operation has been about $2½ million per year. The present collection of the Agency numbers over three-quarters of a million different technical reports. During fiscal year 1958, ASTIA filled requests for over 322,000 documents and produced several million catalog cards and microcards. The Agency also prepared, on request, nearly 1,400 different bibliographies on specific subjects.

The staff of the organization during fiscal year 1958 averaged about 345 personnel, including the staffs for several regional offices. These offices located in Los Angeles, San Francisco, New York City, Dayton, Ohio, and the headquarters at Arlington Hall Station, provide local reference services in areas where Defense laboratories and contractors are concentrated.

The records of congressional hearings and the popular press have many times contained both praise and criticism for the ASTIA operation. On several occasions I have personally questioned major Defense contractors on the use they made of ASTIA services. They all stated they were well satisfied and that the service they were receiving from the ASTIA organization was excellent. The effort of our office, in conjunction with the military departments, is to improve continually the scope and timeliness of the service that the organization offers its users.

For many years, the Agency was geographically split with offices at the Library of Congress and at Dayton, Ohio. In February 1958, these were consolidated into a single unit at Arlington Hall Station. This consolidation has resulted in a savings in total personnel necessary to conduct the operations of the agency and also has reduced the time for processing documents and requests.

As mentioned earlier, ASTIA was established to service Department of Defense laboratories and research and development contractors with technical information. It has never been our intent or purpose that ASTIA should be a technical information office to provide services to the general public. The responsibility for providing such services to the public, industry in general, and the scientific community of the country has been assigned by law to the Department of Commerce, which implements this responsibility through its Office of Technical Services from which you have heard or will hear during the course of this testimony.

The agencies of the Department of Defense which produce research and development technical reports, as a result of the Defense program, forward unclassified documents directly to the Office of Technical Services. That office announces these documents to the general public and makes them available in accordance with standard procedures. ASTIA provides the Office of Technical Services (OTS) with copies of a special monthly Technical Abstract Bulletin (TAB) which lists all of the unclassified and unlimited Department of Defense

research and development reports. This bulletin is made available by the Office of Technical Services for reference purposes at its various field offices. Copies are also provided of a complete technical abstract bulletin on a semimonthly basis which lists all of the new acquisitions to the ASTIA collection. The Office of Technical Services uses these bulletins as a check on its receipts of Department of Defense documents. In addition, ASTIA provides copies of cataloging information including abstracts of those documents which the Office of Technical Services has received from Department of Defense sources. This information is used to provide a reference service. In this manner, the Office of Technical Services and its users have timely information on what reports have been prepared in the Department of Defense.

Like some other Government agencies responsible for security-classified documents, ASTIA has additional problems because of the special handling which must be given classified material. In addition to the safeguards which must be exercised for security, records must be maintained at all times on the specific need-to-know requirements of individual contractors in terms of the work which they are performing for the Department of Defense.

As a result of over a year of study and planning, funds have been allocated within the past month to automate the primary records and procedures of the ASTIA operation for the cataloging, search and retrieval of information, and the security recording of documents. The process of automating the Agency will take nearly a year; but upon completion, the speed of ASTIA service to users should be reduced to the currently feasible economic minimum. The accuracy of security records will be the maximum possible, and bibliographic or other types of searches of the ASTIA collection will be provided in a matter of hours compared to the weeks required at the present time using manual methods.

In conclusion, I would like to summarize the present technical information policy of the Department of Defense as follows:

(1) Since the primary mission of the Defense research and engineering program is to provide the fighting forces of the Nation with the best equipment and techniques which can be provided by our scientific and technological resources, the Department of Defense technical information activities are largely directed to the support of this effort.

(2) The Department of Defense recognizes that it supports a major portion of the scientific and technological effort of the Federal Government. The results of this effort are being released, as security safeguards permit, to the public, industry in general, and the scientific community through the Office of Technical Services of the Department of Commerce.

(3) The Department of Defense has and will continue to collaborate with all Government agencies on technical information matters and particularly will support the National Science Foundation which has been assigned overall coordinating responsibility for this area by the President.

The CHAIRMAN. Thank you very much.

Now, you referred to the Office of Technical Services of the Department of Commerce.

Is your work in the Commerce Department?

Mr. HUFF. No, our work is in the Department of Defense, sir.

We, along with other Government agencies, work closely with the Office of Technical Services. We make Department of Defense technical reports which are unclassified available to the Office of Technical Services, who in turn makes them available to the general public, industry in general, and the scientific community.

The CHAIRMAN. Mr. Wolf, do you have a question?

Mr. WOLF. Not at this time, Mr. Chairman.

The CHAIRMAN. Any questions?

Mr. MILLER. Mr. Chairman.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. Where is Arlington Hall Station?

Mr. HUFF. On Arlington Boulevard, sir, Route 50, just a few blocks west on Glebe Road. It is south of Arlington Boulevard, just a few blocks west of Glebe Road.

Mr. MILLER. What kind of housing?

Mr. HUFF. It is a temporary structure, sir. The National Security Agency was in there for a long time, if that will help you locate it.

Mr. MILLER. I think I know where it is.

Aren't you taking a calculated risk in keeping important documents in temporary buildings?

Mr. HUFF. They are temporary buildings. They are equipped with an automatic sprinkler system. There is adequate water and other firefighting and fire prevention facilities there.

In terms of security, there is, of course, a fence completely surrounding the area and a double fence actually ASTIA Headquarters, itself.

This question has been asked before. We went into it rather thoroughly, and we think that the documents are adequately safeguarded.

Mr. MILLER. Of course, in the event of fire, if your sprinkler system went off, it would do almost as much damage as the fire, itself.

Mr. HUFF. One thing I didn't mention. All of the classified documents are microfilmed and in storage elsewhere.

Mr. MILLER. You have duplicate documents.

The CHAIRMAN. Any other questions?

Dr. Hechler.

Mr. HECHLER. I notice at the top of page 3, Mr. Huff, you mentioned the congressional hearings and the press have contained both praise and criticism of your operations.

What are some of the criticisms of your operation that the congressional hearings and the press have brought out?

Mr. HUFF. I don't recall which committees of the Congress have held hearings in which ASTIA operations were discussed, but I think the criticism referred to here was some of our defense contractors complained about the service rendered; that it took too long to fill requests.

This is the nature of the criticism I was talking about.

In the past couple of years, since I have had some responsibility in this operation, I have deliberately asked questions of some of our major defense contractors. I said, "What kind of service do you get from ASTIA?" I tried to find somebody who would say something bad about it, but I didn't find criticism. They said it is surprisingly good.

We made real gains when we consolidated the operation.

Mr. HECHLER. You feel then that this criticism was of a nebulous nature that you can't do anything about?

Mr. HUFF. I think it was well-founded because the study we had showed that the requests were not being filled as rapidly as they should have been.

Mr. HECHLER. But you feel you have taken steps to meet that?

Mr. HUFF. Yes. I am satisfied, but not content. We are working on it every day.

Dr. Stegmaier, who is here with me today, spends about 75 percent of his time on this project.

Mr. HECHLER. Is there anything this committee could do in the way of assistance to straigthen this out for you?

Mr. HUFF. I think just continued interest; it also helps to have a committee like this have us up and ask us how we are doing, or if you hear criticism, to call us up and ask us about that.

Other than that, I don't have anything specific.

Mr. HECHLER. Thank you.

The CHAIRMAN. Mr. Wolf.

Mr. WOLF. If I am not mistaken, Mr. Huff, I think you were in my office the last week of January. We were talking about at that time how small business could obtain information in the direction of getting Government contracts such as this.

I believe I was trying to establish whether the Government was getting its money's worth out of some of the research and development contracts being let.

I am very happy to have you before the committee today, and I am happy to have a fellow Iowan here.

The CHAIRMAN. Now, if you were a small private company we will say, in some distant portion of the country, and you needed the help of ASTIA, how would you proceed to get that assistance?

Mr. HUFF. Well, if he wanted an unclassified report, his best procedure would be to go to the nearest regional office of the Department of Commerce.

If he wanted a classified report and if he had a defense contract, then he could go directly to ASTIA and make request for the report.

The CHAIRMAN. Do you mean the offices in Los Angeles, San Francisco, New York, and Dayton?

Mr. HUFF. Yes. He could go there.

The CHAIRMAN. Suppose you were down in Louisiana, what would you do to get assistance if you were a small business and wanted technical assistance?

Mr. HUFF. Well, he could go to the small business representative, for one, the nearest one, or he could write directly to ASTIA.

The CHAIRMAN. He could write to you and you would process his letter?

Mr. HUFF. Yes, indeed.

The CHAIRMAN. And give him, if possible, the information he needs?

Mr. HUFF. That is right.

The CHAIRMAN. And if he doesn't get what he needs at that time, he would then best visit one of your offices, probably this one here?

Mr. HUFF. That is right. But he could even write to Dr. York's office. We get innumerable letters, sir, right in my office, and Dr. York's office handles the kind of requests you are talking about. We usually can give him explicit directions on the steps he ought to take to get the relief he seeks.

The CHAIRMAN. That would cover any type of scientific data or technical material that he needed?

Mr. HUFF. Any data that originates within the Department of Defense that we can make available to him, within the rules of security.

The CHAIRMAN. If it is classified, he would have to first get cleared for classified material?

Mr. HUFF. That is right. He would have to establish a need to know.

You see, we have a field of interest register, we call it, which covers 33 different fields of science and engineering, and if he is working with the Department of Defense in any one of those fields, it is not much of a problem to establish the need-to-know for that kind of material, and then we could furnish the classified material upon his request. If he is cleared, there is no problem.

The CHAIRMAN. Fine.

Well, thank you very much, Mr. Huff, for coming here and for your statement.

Now we have Dr. Frank Rogers, Lieutenant Colonel, Medical Corps, U.S. Army.

Dr. Rogers, do you have a prepared statement?

Dr. ROGERS. I prepared a statement. I do not have multiple copies of it to distribute.

The CHAIRMAN. Well, will you proceed with your statement?

STATEMENT OF DR. FRANK B. ROGERS, DIRECTOR OF THE NATIONAL LIBRARY OF MEDICINE [10]

Dr. ROGERS. Mr. Chairman, I deem it a privilege to have this opportunity to present my views before this committee.

I would like to discuss briefly the role of the scientific research library as I see it, and to illustrate my remarks by giving specific examples of the activities of the National Library of Medicine.

A specialized library is a library which is concerned with one field of knowledge rather than the totality of knowledge, and which seeks to serve the practitioners in that particular field of knowledge rather than the public as a whole.

A science library is a library which contains materials dealing with science, and it seeks to serve the community or scientist.

The service which such a library renders may be broadly styled "communications," but it is a special kind of communication. It is only distantly concerned with mass communication. It is a kind of catalyst for effective person-to-person communication over large barriers of time and distance.

To provide this service the library needs first something to communicate, and second the means and will to communicate it. We must collect the literature of our subject; we must organize it so that we will have something more than an amorphous mush of noise to transmit; and we must make the organized materials available for use.

[10] Rogers, Frank Bradway, lieutenant colonel, U.S. Army, born Norwood, Ohio, 1914. Education: A.B., Yale University, 1936; M.D., Ohio State University, 1942; M.S., Columbia University School of Library Service, 1949. Military Service: Intern, Letterman Army Hospital, 1942; faculty, Medical Field Service School, Carlisle Barracks, Pa.; battalion surgeon, 35th Infantry Regiment, 25th Division Luzon, the Philippines; surgeon, 25th Infantry Division, Japan. Present position; Director, National Library of Medicine, 1949–. Memberships: American Medical Association, American Association of the History of Medicine, American Association for the Advancement of Science, Medical Library Association, American Library Association.

If the library is a national library, with a national audience, it is likely that the printing press and its occasional substitute, the camera, will have to be pressed into use in order that effective communication can take place over a wider territory than that of the locality in which the library happens to be situated.

I would like to illustrate these points with reference to my own library, the National Library of Medicine.

The NLM takes the literature of medicine for its province, and seeks to serve medical people everywhere. It is difficult to say where medicine begins and ends, because there is no end and no beginning. Practically, we have to place arbitrary limits. This means that we do not collect materials on economic theory, even though this bears on the incidence of disease, nor on entomology in general, even though some species of insects serve as disease vectors.

The National Library of Medicine is one of the three large research libraries of the Federal Government which together form, in effect, the National Library of the United States. The other members of this trio, the Library of Congress and the Library of the Department of Agriculture, acknowledge that the prime responsibility for developing an exhaustive collection of medical literature rests with their sister medical library.

Having collected our material, we must put it in order for use, so that it may actually be retrieved, on demand, by whatever small subject category may be specified. To this end we compile catalogs and indexes of the material, with multiple subject and author approaches.

Then we must make the material available for use. This involves chiefly the publication of catalogs, indexes, and special bibliographies and their wide distribution for all to see and use, and it involves making the primary materials available for examination and study, once they have been located through means of the bibliographic tools.

I would like to show you some examples of the bibliographic publications of the National Library of Medicine.

Every year my library publishes this annual catalog of books in medicine which went through our hands during the preceding calendar year. These books are listed in author arrangement, and then again by subject.

The catalog for 1958, which is just coming out this week, is the largest we have yet published. It contains over 30,000 entries by author and subject in a thousand pages. This catalog is published for us by the Library of Congress, and is sold through the Library of Congress for $17.50 a copy.

Each month the Library publishes the Current List of Medical Literature, an index to the periodical literature of medicine worldwide. In this index every year we are covering 110,000 medical articles from the medical literature of the world, to which we are furnishing half a million subject and author entries. Every 6 months, cumulative author and subject indexes are published to facilitate search. There are some 4,500 subscribers to this publication.

Besides these regular publications, we publish occasional long bibliographies on topics of great current interest. One such bibliography is this "Bibliography of Space Medicine" which the National Library of Medicine published last summer; it reviews the literature of space medicine since around the beginning of the last war.

Our latest long bibliography is this bibliography entitled "Psychopharmaca," which is a listing of the articles of medical literature which have appeared since 1952 on the subject of drugs affecting the psyche, the tranquilizers, drugs of that kind.

Another example of an occasional publication is this 80-page publication we put out last fall entitled "Guide to Russian Medical Literature," in which we attempted to give a modest and simple guide as to how to find what you want to find in the medical literature published in Russia.

It may be possible to give some idea of the resources of the National Library of Medicine and of the extent of the services which it makes available by giving some simplified quantitative indicators.

In the field of acquisitions, where we are trying to put our hands on all documents which bear on health and disease regardless of language, time, or place of publication, we are adding one new piece—book, journal, issue, thesis, pamphlet—to our collection every 1½ minutes of every working day.

Let us take this 90-second period, use it as a basic unit, and see what other things are taking place during the same time.

Every 1½ minutes we are listing in our indexes and catalogs two journal articles, books, theses, pamphlets, or parts of books.

Every 1½ minutes we are sending out 200 printed index or catalog pages to medical institutions throughout the world.

Every 1½ minutes we are loaning an article or a book to someone outside the library. Most of these loans are issued in the form of photographic reproductions, and in that minute and a half we produce about 16 pages. It is interesting to note that 1 out of 10 of these loans is sent outside the continental United States.

These and other activities keep a staff of 224 people very busy, indeed. And 224 people, and over a million medical titles on the shelves, and a collection increasing at a rate which requires an additional half-mile of linear shelf space each year, all of this requires a goodly amount of physical space in which the collections may be housed and the operations carried out.

I am happy to say that after 40 years of effort we are now about to acquire the new library building which we need so badly. Last year Congress appropriated the necessary funds, the basic construction contract has just been awarded, and on June 12 we will have a groundbreaking ceremony at the new site, which will be in a corner of the National Institutes of Health reservation in Bethesda. I would like to issue a warm invitation to all members of this committee to join with us in celebrating this great occasion.

Our new building will be ready for occupancy in 1961; moving to the new location will be a fine way to mark the 125th anniversary of the founding of the library, which occurs in that year. Founded in 1836 by the Surgeon General of the Army, developed as a national resource by Dr. John Shaw Billings during the latter part of the past century, and transferred to the jurisdiction of the Public Health Service of the Department of Health, Education, and Welfare by an act of Congress in 1956, the National Library of Medicine expects to continue to make its resources available to all men everywhere who work close, heart and hands, to the problems of disease.

Mr. Chairman, I would be glad to try to respond to any questions which the committee would care to put to me.

Thank you very much.

The CHAIRMAN. Thank you very much, Dr. Rogers. We appreciate your fine statement.

I notice that you state the library was founded in 1836. I have a recollection of some legislation or something that we had a number of years ago before the Armed Services Committee about the Medical Library.

Was that simply to provide you with space or to provide you with more legislative position in reference to a separate library?

Dr. ROGERS. Sir, the library was founded in 1836 by the Surgeon General of the Army, and it remained under the jurisdiction of the Army for 120 years. It was known originally as the Library of the Surgeon General's Office, U.S. Army.

In 1922 the name was changed to Army Medical Library, and in 1952 the name was changed again to the Armed Forces Medical Library.

Now it was subsequent to 1952, when the library was the Armed Forces Medical Library, that we were up here on the Hill seeking appropriations for a new building for this library.

In 1956 the National Library of Medicine Act was passed by the Congress, which transferred the old Armed Forces Medical Library to the Public Health Service as the National Library of Medicine and in the same bill authorized construction for the new building which we are now about to get.

The CHAIRMAN. Well, as I remember the testimony at that time, I would say that your statement here is a very modest statement. The committee was told that we had documents in that library that are priceless and some of which go back historically to the very first developments in medicine in ancient times. Those documents have been preserved to form what is now the finest medical library in the world.

Am I putting it too strong?

Dr. ROGERS. I don't think so, sir. The collection is remarkable. There are a very large number of unique documents in the collection. We are in pitiful shape as far as the building is concerned. Since 1942 we have had to house the oldest and rarest books we have in rented quarters in Cleveland, Ohio, and there is no place to return those materials to the main part of the collection until our new building is completed in 1961.

The CHAIRMAN. Any questions?

Mr. MILLER. I would like to join you. I know, aside from having heard the testimony, of the very fine work done at this library. It is something of which this country can be extremely proud.

I am happy that there are going to be provided new, and I hope adequate, facilities on the grounds of the National Institutes of Health, for this is a unique collection. I know doctors from my district who have come here visiting and have spent part of their time down on Independence Avenue going through the library.

The CHAIRMAN. We appreciate the invitation to be on hand at the ground breaking. I hope the members of the committee will bear that in mind. That includes the staff too, does it not?

Dr. ROGERS. Yes, indeed.

The CHAIRMAN. I hope that at least some of us can be present on that historic occasion. We certainly thank you for coming here, sir, and if there is no further business, the committee will recess until Thursday morning at 10 o'clock.

(Whereupon, at 11:37 a.m., the committee recessed, to reconvene at 10 a.m., Thursday, May 28, 1959.)

DISSEMINATION OF SCIENTIFIC INFORMATION

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Thursday, May 28, 1959.

The committee met, pursuant to recess, at 11:16 a.m., Hon. Overton Brooks (chairman of the committee) presiding.

The CHAIRMAN. The committee will come to order.

This morning we have Mr. W. T. Knox, from Esso Research & Engineering, who will give us some technical information regarding the dissemination of scientific information.

It is my understanding that Esso Research has a very large research program and uses freely the information which, the committee has been told in the preceding hearings, was available to private industry. The witness will no doubt tell us to what extent these libraries and facilities are available and are of help to private industry.

Do you have a prepared statement, sir?

Mr. KNOX. Yes, sir.

The CHAIRMAN. All right, sir, if you will proceed with your prepared statement, we will be delighted to hear you.

Mr. KNOX. Thank you, sir.

STATEMENT OF WILLIAM T. KNOX, DIRECTOR OF TECHNICAL INFORMATION DIVISION, ESSO RESEARCH & ENGINEERING CO., LINDEN, N.J.

Mr. KNOX. Mr. Chairman, members of the committee, I am very glad to be here this morning. I am the director of the Technical Information Division in Esso Research & Engineering Co., in Linden, N.J. This company is a major scientific and engineering affiliate of the Standard Oil Co., Inc., of New Jersey, which I will call the Jersey company.

Those affiliates of the Jersey company which refine, market, and transport crude oil and petroleum and petrochemical products look to Esso Research to develop new processes and products and to give technical advice on improving the efficiency of their operations and the quality of their existing products. This is the framework of our operation.

We have about 1,200 professionally trained scientists and engineers at our central facilities. In addition, we have research contracts with some other Jersey affiliates representing about 500 more professional employees.

So the job of the technical information division is to serve about 1,700 professional people.

As I understand, the purpose behind your inviting me today, you felt that the outlook of a large industrial research and engineering organization, which is typical of a major segment of the country's research and engineering effort, would be helpful in your consideration of the problems involved in insuring that American scientists and engineers are provided with adequate scientific and engineering information.

In other words, you wanted to hear from a large user of technical information, as Mr. Brooks said. My testimony will be based on our experience at Esso Research, where I have been for the last 21 years, the first 18 of which were in research and development on petroleum processes and products.

I am a member of the Science Information Council of the National Science Foundation about which I understand you will shortly hear from Drs. Waterman and Adkinson of the National Science Foundation.

I am also presently serving on a special visiting committee to the Science and Technology Division of the New York Public Library. So much for the background.

Since the First World War, when American science and technology began their astounding growth, Jersey and its affiliates have recognized the important place that science and technology would play in the petroleum industry. They have always been conscious of the value of published technical information. At the time of the formation of the original Esso Research & Engineering organization in 1919, an information division was one of its four main divisions.

For a number of years Esso Research management has recognized that keeping up with the technical literature was becoming an increasingly difficult problem for its technical staff. You have already heard some numbers from some of the previous witnesses showing how rapidly the problem is increasing in difficulty.

Since our primary field is chemistry and chemical engineering, the numbers which bring the problem home to us most forcibly are the 58,000 abstracts in Chemical Abstracts in 1950, and the 117,000 abstracts in 1958—a doubling in 8 years.

Esso Research, therefore, early in 1957, established a technical information division on a broader scope than had existed heretofore. The primary function of this division is to obtain, interpret, and disseminate to the Esso Research & Engineering professional people and professional people in the Jersey affiliates, scientific and engineering information as it appears in the published literature. We have about 70 people in this division. So, as Mr. Brooks says, it is a rather large one.

In order to save your time, I am going to refer only by title to two articles which describe the formation and function of this division in detail, and I will leave these with Colonel Schuppener.

One of them is entitled "Management's Views on Technical Information Activities," and the other one, a more glamorous article, entitled "System of the Future Gets Information to the Technical Men Who Need it."

Since we, however, have a large and extensive program I am going to talk a little bit about the broad outlines of how this division functions. Basic to the division, of course, is the technical library. Our library has about 40,000 volumes of books and bound issues of peri-

odicals and 60,000 copies of patents from the United States and other countries.

Abstracts of articles of interest to us are filed on cards which are arranged by subject and author. I have one of these cards with me just so that you can see what it looks like. It is an abstract pasted on a slip of paper which we call a card. We now have almost 2 million cards in our files. These files are our primary reference sources when we want to find information.

Our current input is about 600 technical journals, of which 300 are from the United States, 180 from Western Europe, 27 in Russian and other Slavic languages, 9 in Japanese, and 20 from various other sources.

We have a continuous program of acquiring new books, about 1,500 per year, and weeding out obsolete books. New patents from all sources amount to about 3,000 a year. We also get copies of about 2,500 reprints of papers for many technical meetings. These appear many months before they are printed in a journal and in some cases they are never printed at all, so they are a very valuable source of technical information.

Another basic unit of this division is a central technical file which processes and directs to the person in Esso Research who should get it, about 150,000 pieces of technical correspondence per year.

Formal technical reports from the various other technical Esso Research & Engineering divisions represent the fruit of our research, development, and engineering efforts, and as such, of course, they are most valuable. We have a special report unit which indexes, stores, and retrieves from storage the technical information which we generate within our own company.

So these three units are the foundation of the division: The library for published information; the reports unit for our formal reports; and the central files for correspondence.

For the benefit of the scientific staff in Esso Research, and also professional and managerial groups in the Jersey affiliates throughout the free world, we publish several abstracts bulletins. I have with me some sample copies of these bulletins. We have one here on transportation and storage; another one on manufacturing literature; another one on manufacturing patents; and another one on applied mathematics literature. These contain abstracts of all of the published articles which we think will be of interest.

On the front of the two largest bulletins we place a 1-page brief summary or highlights of the contents inside. These bulletins are the primary means by which our professional staffs keep up with the scientific and engineering literature.

We rely on our own abstracting efforts, but we supplement these with outside abstracting services. One of the best of these in our experience is the American Petroleum Institute Central Abstracting Service. We find this very helpful. We are quite interested in the current studies to broaden the scope of this service and possibly provide a cooperative indexing and information searching center for the petroleum and petrochemical industry.

We also supplement our own abstracting efforts with abstracts from the well-known Chemical Abstract service of the American Chemical Society.

The net result of our abstracting efforts is that technical staffs of the Jersey company and its affiliates get in these abstracts bulletins the most important items as they appear in periodicals, patents, and reprints of technical meetings. About 15,000 abstracts are published each year. This is a large number, but it is only a fraction of the total number of items being published in our fields of interest.

As you have probably heard from some of the preceding witnesses, keeping this vast store of information in a readily accessible form is a difficult problem, and it gives promise of being even more difficult before we reach a better solution.

We have a small group within the technical information division whose job is to look for techniques which will made the storage and retrieval job much simpler. We have emphasized applying rather simple machine-based techniques where they can be economically justified. There are many such techniques and devices available, and we have made some real progress. We envision even more progress in the years ahead.

Now, to a most unusual function of this division. A group of scientists and engineers who are devoting their full time to keeping up with, analyzing, and interpreting and calling others' attention in the company to developments in technical fields of interest to Esso.

We call this information research, and it is described rather completely in a paper to be presented next week at the Fifth World Petroleum Congress in New York, and I will again leave a reprint of this paper with Colonel Schuppener and summarize only the points of real direct interest to you.

Having this group of experienced professional men engaged full time in information work is quite a break from the past and with tradition. The technical men in this work are fully professional and are as competent as any technical men that we have in the laboratory or engineering divisions. It has traditionally, of course, been a part of the technical man's responsibility to do his best to keep up with the literature. With the literature now of such formidable proportions, it is no longer possible for any one man to do this except in a very narrow field. Our technical men engaged full time in what we call information research know the company's technical programs and the people in the company who are working on various parts of this program. They make sure that items of pertinent interest to various individuals in the laboratory or development or engineering divisions are called very promptly to their attention so they won't be overlooked.

They also look for new ideas and new applications of existing ideas, which they then bring to the attention of the responsible member of management for possible inclusion in Esso Research's program.

These men examine every abstract which we obtain through our own efforts and through subscription to the services that I mentioned earlier. From these thousands of abstracts, they select this limited number that we call the highlights.

In addition to putting the highlights in front of the bulletins, we also send this single page of highlights to about 300 professional people, including members of management, so that they get a very condensed summary of what we think are the real technical highlights of the week appearing in the world's literature.

I would now like to make some personal observations about this problem, which are based on our experience in Esso Research & Engineering.

First, the manner of using the published literature varies greatly from one technically trained man to another. What one man wants, the next man does not want. It is, therefore, very difficult to generalize about patterns of use of scientific information, or to say that our scientists and engineers want this kind of scientific information or they want it presented in such a manner.

The use or the manner of using the published literature appears to correlate most closely with what a man is used to, and perhaps also to the nature of his job. The staff at Esso Research & Engineering have had abstracts bulletins available to them for many years, and a new professional employee is given his copy very soon after his arrival with the company. I think that is probably why they use these abstracts bulletins as their primary means of keeping up with the literature. These are merely our effort to make sure that he is currently aware of the scientific and technical literature pertinent to his work. We hope that by making it more available it will encourage him to use it.

I also believe that considerably more could be done in most colleges and universities to train science and engineering graduates in the most efficient use of the technical literature. Few graduates appear to have more than a casual acquaintance with technical information sources and searching procedures.

Secondly, our experience at Esso Research & Engineering with information research work leads us to believe there is a wealth of new ideas and new applications of existing ideas which can be made available to those who will take the time to study the literature. The main problem is putting high quality scientists and engineers to work in this field. We feel it is very important to realize that the United States has no shortage of information, but a real shortage of people who are talented and trained and motivated to make use of this information.

Our experience with first-rate scientists and engineers engaged full time in information research has been very good. Without an elaborate information processing system employing electronic computers and similar devices, we found it quite feasible to use the published literature in our field and to use it very effectively.

I want to thank the committee for allowing me to appear before it today and give this testimony. I will try to answer any questions you may have.

The CHAIRMAN. Mr. Knox, I would like to ask you a question. I think your statement is excellent and it gives the committee a very good idea of how any private institution or corporation might use and wish to use the available information.

Have you found any difficulty in obtaining information relating to developments in petroleum or along the general lines of the operations of your company from behind the Iron Curtain?

Mr. KNOX. We, of course, Mr. Brooks, restrict ourselves to published information.

The CHAIRMAN. You don't operate in Russia, do you?

Mr. KNOX. No, sir, just within the free world.

The CHAIRMAN. Or in the Iron Curtain countries generally?

Mr. KNOX. Not at all.

The CHAIRMAN. Do you feel that you have information as to the developments in those countries that might pertain to your work?

Mr. KNOX. Yes, sir. We have for many years obtained through distributors—sometimes in this country, sometimes in Europe—all of the foreign publications we felt had items which would be of interest to us. We have never restricted ourselves as to amount of money we wanted to spend on getting these foreign publications. We recognize that information is expensive, and we have obtained at all times all of the foreign publications which we thought would be of interest.

The CHAIRMAN. Along that line, do you feel that those publications are free and unrestrained? Are they giving you information on the developments you are interested in?

Mr. KNOX. We have found quite a few items in these publications which are very interesting. They appear to be genuine results of research and engineering work.

The CHAIRMAN. Would you say that the Russian scientists have shown the ingenuity to stay ahead of your company in developments, or are your scientists able to stay ahead of the Russians?

Mr. KNOX. I don't think I am qualified to answer that, sir.

The CHAIRMAN. Do you know of any developments in petroleum that they have put to practical application that we don't have in this country?

Mr. KNOX. No, sir.

The CHAIRMAN. So if there are such developments, you are not aware of them?

Mr. KNOX. That is correct.

The CHAIRMAN. So far as you know, our scientists in petroleum are at least up to and perhaps surpass the Russian scientists?

Mr. KNOX. I believe we could say that on the basis of the published literature—that is, assuming they publish a representative sample of what they are doing, as we publish a representative sample of what we are doing.

The CHAIRMAN. You are in charge of that. Does the literature you see coming out of Russia seem to be representative in character?

Mr. KNOX. Not knowing the source from which it comes, I don't think I could really qualify to answer that question, sir. It appears to be in most cases about the same kind of material that we see in our technical publications.

The CHAIRMAN. Do you experience any difficulty in obtaining publications from behind the Iron Curtain?

Mr. KNOX. Not at all.

The CHAIRMAN. So they are freely sent?

Mr. KNOX. Yes, sir.

The CHAIRMAN. Does your company avail itself of whatever ideas are in those publications?

Mr. KNOX. That is correct.

The CHAIRMAN. The idea I am driving at, of course, is to find out what we do know about what is happening behind the Iron Curtain and also to make a comparison as to whether or not our people are behind the Iron Curtain countries or ahead of them in scientific development. I think you understand.

Mr. KNOX. Yes, sir.

The CHAIRMAN. One more question and then I am through.

I made a note as you went along. You say, "We call this information research." Just what do you mean by "information research"?

Mr. KNOX. We are contrasting this work, really, with laboratory research or with conventional engineering. We are saying that we have technical men who spend full time working with literature. They solve problems. They get ideas—not from doing experiments or from doing engineering calculations themselves—but they get ideas and solve problems by finding out what others have done and published.

In other words, we are making use of recorded information instead of generating new information.

The CHAIRMAN. In addition to assembling that information, you do have developments from your own scientists?

Mr. KNOX. Yes, sir.

The CHAIRMAN. Any questions?

Mr. McDonough?

Mr. MCDONOUGH. The ultimate objective of all of this research is to improve the product of Esso Standard Oil, is it not?

Mr. KNOX. To improve and also to develop new products and processes, yes, sir.

Mr. MCDONOUGH. This is all overhead expense. This is not production?

Mr. KNOX. Our sole product is technical know-how and information from this company, the Esso Research & Engineering Co.

Mr. MCDONOUGH. If you put the information you obtain from these abstracts to some practical use, does it become the product of Esso, and is it confined strictly to Esso? You don't exchange this information with other industrial operators in the same business, do you?

Mr. KNOX. Our use of the information is not exchanged with others. The American Petroleum Institute, though, has a central abstracting service and those abstracts are freely available to anyone who wishes to subscribe to this service.

So, since we use this, you could also say we are using the same pool of information that others are using, too.

Mr. MCDONOUGH. But the particular objective of your research is the improvement of the petroleum industry and the petrochemical industry?

Mr. KNOX. That is correct, sir.

Mr. MCDONOUGH. That is all, Mr. Chairman.

The CHAIRMAN. Mr. King.

Mr. KING. I notice, Mr. Knox, you say that out of 600 technical journals from which you draw, half of them are from this country and only 27 from Russia and other Slavic languages.

The testimony that we have received in this committee is that the Russians are probably the only group that can seriously challenge our scientific supremacy—and I am not suggesting that other countries do not have a contribution; but Russia really has a contribution—just how much is open to question.

But my question is: Why are you limited only to 27? Is it because that is all that you have available, or is it only as a matter of choice? It would seem to me that Russia would be your great source of technical information outside of the United States.

Mr. KNOX. Mr. King, it is a matter of choice from those journals which are available. There are, of course, quite a few others available. I am no expert on relative merits of the different countries as far as scientific developments are concerned, but I could say very definitely that the journals from the Western European countries contribute very heavily to our store of technical information.

We, as you noticed, subscribe to about 180 journals from the Western European countries.

Mr. KING. Putting it bluntly, would you say that the contribution of the Western European countries is considerably greater than that from all of the Russian and Slavic-speaking countries and in the proportion to which your subscriptions to their journals would reflect?

Mr. KNOX. In our fields of interest, that would be a fair statement.

Mr. KING. Would that indicate that Russia, comparatively speaking, has not done as much in the field of petroleum research as it has in fields of, shall we say, space or atomic research in which they definitely have made a tremendous contribution?

Mr. KNOX. I am afraid I cannot qualify as an expert in making that comparison. I can only state it as far as the petroleum field is concerned. Most of our ideas and information do come from Western European countries, as contrasted with the Russian orbit.

Mr. KING. Do I interpret you correctly to say, then, that you do not look upon Russia as one of the great pioneers in the field of petroleum research?

Mr. KNOX. That is correct.

The CHAIRMAN. If committee members have no further questions, I would like to ask you about your use of the facilities of the Library of Congress, the National Medical Library, the John Crerar Library in Chicago, and other facilities. Have you any recommendations about how we could improve that service?

Mr. KNOX. I think my only comment would be aimed at a problem which I believe is one of administration regulation; namely, the matter of the need-to-know regulation, which is applied to most Government research reports.

In an organization which has no Government research contracts, as a general matter, it is most difficult to get a report on Government research which appears to be of interest, because it has not been established that you have a need to know, which I believe is particularly a Department of Defense criterion.

The CHAIRMAN. Do you qualify your research men for security purposes with the United States?

Mr. KNOX. We have certain contracts with the Defense Department, and I believe Dr. Longwell testified before this committee not too long ago about one of them.

The people who are assigned to work on those contracts of course have access to the Government research reports. They have a defined need-to-know. The great bulk of the scientists and engineers in Esso Research under current regulations are not entitled to get at that information.

The CHAIRMAN. You would then recommend that the requirements of the need-to-know program be relaxed, at least to some extent, to make available to those companies that do not have Government contracts for research, information that might be available?

Mr. KNOX. Yes, sir. At least it should be carefully studied. We do have this difficulty in getting the reports.

The CHAIRMAN. I would think, as a taxpayer, unless there is some vital reason for withholding the information, you would be entitled to it. Furthermore, it would be in line with the program of scientific development in this country that those industries that want to go ahead would be facilitated, if it is possible without endangering the security of the country to do so. Is that your thought?

Mr. KNOX. Yes, sir.

The CHAIRMAN. Do you have any other recommendations that could be put into operation which might help scientific development?

Mr. KNOX. No, sir. I think I have covered it.

The CHAIRMAN. In your opinion is there a shortage of scientific manpower in the United States, or a surplus?

Mr. KNOX. I would certainly say that there is a shortage of high-quality scientifically trained manpower.

The CHAIRMAN. You feel on a lower level there is an ample supply? It is at a doctorate degree level where the shortages occur; is that right?

Mr. KNOX. Yes, sir. There is a great shortage at that level.

The CHAIRMAN. So that this committee might very well look into the proposition of encouraging those scientists to go further in their studies to reach a higher level?

Mr. KNOX. Yes, sir. I am no expert on it. Whether we are getting all of the people going on for Ph. D.'s that could qualify now, I don't know. It may be that the need is for more people of high quality starting at the beginning of college and working their way through to the top.

The CHAIRMAN. Start at the bottom and be more selective in educating the scientists?

Mr. KNOX. Or just get more of the high-quality people that are not being tapped now.

The CHAIRMAN. I understand the technical information program of your company runs about a million dollars a year?

Mr. KNOX. Yes, sir, a little over a million dollars a year for the information work.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. Do you exchange information with other of the Esso family companies?

Mr. KNOX. Yes, sir.

Mr. MILLER. On a free basis? In other words, I am conscious of the fact that Standard of California has a big research and development program.

Mr. KNOX. That is restricted to the Esso family, Mr. Miller. This does not include Standard Oil of California or Standard Oil of Indiana or any of the other Standard Oil companies. This is only the Jersey——

Mr. MILLER. Just your own subsidiary?

Mr. KNOX. Just the Jersey company and its affiliates, yes, sir.

Mr. MILLER. Then you do not have a free exchange with the Standard Oil family or other major oil companies?

Mr. KNOX. No, sir.

The CHAIRMAN. They have their own research programs?

Mr. KNOX. That is correct, sir.

Mr. MILLER. In the production field oil companies generally exchange technical information rather freely?

Mr. KNOX. We exchange technical information through the medium of the published literature and patents. They have access to what we know when we publish a patent or when we publish a journal article.

Mr. MILLER. I was talking about production or recovery of oil from the ground. I have seen petroleum engineers of two different companies who seem to get along very well.

The CHAIRMAN. Will the gentleman yield? Of course some States have laws that require, as a conservation measure, certain cooperative arrangements for sharing information regarding recovery of oil. Is that not right?

Mr. KNOX. Yes, sir. Esso Research & Engineering is not in the production and exploration business, so I am no expert on this at all.

Mr. MCDONOUGH. In other words, this is research on the product after it is brought to the surface and it is in the manufacturing stage?

Mr. KNOX. Yes, sir; that is right.

Mr. MILLER. So you can have Golden Esso that is supposed to be a little better than Amoco's——

Mr. KNOX. You may delete that word "supposed."

The CHAIRMAN. I think that covers it. Mr. Knox, we certainly thank you for coming here and appreciate the cooperation of your company.

I think, Mr. Miller, he answered that last question very enthusiastically.

Before we adjourn, I wish to make an announcement. I am told that some members of the committee did not obtain autographed pictures of the astronauts when they were here. That is because they did not have an opportunity to sign enough of them. The committee has additional copies for those who did not receive the autographed copies. If you make application to the committee staff, they will be glad to obtain prints for the members.

I wish you would spread the word around because we do not want anyone to be left out who is interested.

I want to say this, too. Colonel Schuppener, you handled this particular hearing?

Colonel SCHUPPENER. Yes, sir, Mr. Carstarphen and I.

The CHAIRMAN. Mr. Knox is our last witness?

Colonel SCHUPPENER. No, sir. We have 2 days of hearings next week.

The CHAIRMAN. On this particular subject?

Colonel SCHUPPENER. Yes, sir. We have Dr. Waterman of the National Science Foundation on Tuesday, Mr. Miles Conrad representing one of the abstract services, and Mr. John Green of the Department of Commerce. He is Director of Technical Services.

The CHAIRMAN. I think thus far the hearings have been excellent. We have obtained a lot of useful information. I thought you were handling the hearings very well, and I want to say we are well pleased with the way they are going.

We will conclude them next week.

If there is no further business, then, we will adjourn, permitting Mr. Miller's committee to go ahead with its program tomorrow. We will be delighted to have those who can join him do so.

We will then recess the committee until next week and everybody will be notified.

(Whereupon, at 11:55 a.m., the committee recessed.)

DISSEMINATION OF SCIENTIFIC INFORMATION

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Tuesday, June 2, 1959.

The committee met, pursuant to recess, at 10 a.m., Hon. Victor L. Anfuso (acting chairman) presiding.

Mr. ANFUSO. This meeting will come to order.

Today's session will be on the dissemination of scientific information.

We are happy again to have Dr. Waterman, Director of the National Science Foundation. Dr. Waterman, it is nice to have you here again. I understand you would like to have Dr. Adkinson sit with you.

Dr. WATERMAN. And Mr. Ruttenberg.

Mr. ANFUSO. And Mr. Ruttenberg?

Dr. WATERMAN. Yes.

Mr. ANFUSO. You may proceed.

STATEMENT OF DR. ALAN T. WATERMAN, DIRECTOR, NATIONAL SCIENCE FOUNDATION, ACCOMPANIED BY DR. BURTON W. ADKINSON, HEAD, OFFICE OF SCIENCE INFORMATION SERVICE, NSF, AND CHARLES RUTTENBERG, ASSISTANT GENERAL COUNSEL.

Dr. WATERMAN. Mr. Chairman and members of the committee, I appreciate this opportunity to present the National Science Foundation's views on the status of the dissemination of scientific information in the United States. My testimony will be divided into three parts.

First, I shall describe briefly the nature and scope of the scientific information problem.

Second, I shall indicate what the Foundation believes to be its role in this field.

Third, I shall outline briefly the areas of scientific information in which the Foundation has programs and the principal kinds of activity in each of these.

The nature and scope of the scientific information problem: The reason scientific information has become a major problem, particularly since World War II, is that the spectacular growth in science and technology has multiplied the volume of scientific publication to a point where existing and well-organized systems are not adequate to provide for the information needs of the Nation's scientists and engineers. When one considers, too, that much of what is significant

in science is being published in unfamiliar languages, it is clear that the working scientist is faced with almost insuperable problems in attempting to keep himself informed on what he needs to know.

This double-edged problem has received increasing attention both within and outside the Government. Vigorous efforts to provide solutions are already underway, but much needs to be done to assure the ready availability to all U.S. scientists of the world's current and past output of significant scientific information.

Some idea of the volume of increase of scientific literature may be had from the fact, as reported in Dr. Mumford's testimony before this committee, that the science and technology collections of the Library of Congress have doubled in the last 20 years and now total more than 1½ million volumes of books and periodicals.

Statistics from other sources indicate that research literature in chemistry and related fields doubles every 8½ years. It is known that more than 55,000 scientific and technical journals are issued annually, containing about 1 million articles of significance for some branch of research and engineering in the physical and life sciences. This is the order of magnitude and growth of scientific information.

The language difficulty is reflected in the fact that more than one-third of the world's scientific and technical literature is produced in the U.S.S.R., China, and Japan. Statistics indicate this material can be read by less than 2 percent of U.S. scientists and engineers. It has been estimated that about 50 percent of all scientific and technical literature appears in English, but at least one-third of the world's literature is a closed book to U.S. scientists unless it can be approached through abstracting, indexing, and translating.

The system the Russians have developed for meeting their own scientific information problems in our judgment would not be equally effective in meeting ours. Our research efforts are organized and administered very differently, and it is illogical to suppose that a highly centralized organization for the dissemination of scientific information would serve our purposes equally well. Moreover, the Russians could not call upon the services of numerous highly developed scientific information organizations such as we find already in existence in the private enterprise structure of our country.

This fact, incidentally, was recognized by the Congress in the National Defense Education Act, in specifying that the Foundation should take the lead in supporting measures leading to a more effective dissemination of scientific information but not try to do the whole job.

I should like now to review briefly the role of the National Science Foundation in the field of scientific information. As we see it, the role of the Foundation is to identify and analyze the strengths and weaknesses in existing practices and then to take aggressive action both to develop solutions to present problems and to encourage and support a long-term program of research looking toward development of new and improved techniques of information handling.

This involves the constructive evaluation of existing procedures and practices for the dissemination of scientific information, supplementing and assisting where necessary, and the development of solutions to problems through cooperation and coordination of the agencies and organizations concerned. We would retain the benefits of the existing complex of scientific information services while working at

the same time toward remedying its defects. It is our belief in this direction lies the road leading toward effective national scientific information services.

Under the National Science Foundation Act of 1950, the Foundation has devoted special attention to the information needs of scientists and has developed a series of programs designed to help meet those needs to the extent of its limited resources. During the past year, actions taken by the legislative and executive branches have given the Foundation greatly expanded responsibilities in the field of scientific information.

In addition to broadening its own programs in the area of scientific information, the Foundation has been asked to assume national leadership in efforts to improve scientific information services carried on both within and outside the Federal Government.

Coordination of scientific information activities within the Federal Government: The President approved on December 7, 1958, a plan, proposed by his Science Advisory Committee, for the effective coordination of scientific information activities within the Federal Government and for the review, coordination and stimulation, on a nationwide basis, of activities in all areas of scientific information.

By letter of January 22, 1959, the President asked the Foundation to carry the responsibility for the implementation of this plan. This letter was followed by Executive Order 10807, dated March 13, 1959, which not only created the Federal Council for Science and Technology, but also further delineated the role of the National Science Foundation in the scientific information field by stating as follows:

> The National Science Foundation shall provide leadership in the effective coordination of the scientific information activities of the Federal Government with a view to improving the availability and dissemination of scientific information. Federal agencies shall cooperate with and assist the National Science Foundation in the performance of this function, to the extent permitted by law.

In order to effect improved coordination of scientific information activities within the Federal Government, the Foundation established an interdepartmental committee, the Federal Advisory Committee on Scientific Information, which met first on January 20, 1959. The Committee is composed of senior members of 17 Federal agencies with significant information activities. Currently this Committee has under consideration a range of matters dealing with problems involving the dissemination of unpublished research reports and the joint support and expansion of indexes to foreign scientific literature.

Considerable stress has been laid on furthering cooperation and coordination of scientific information activities among Federal agencies. Almost every agency has and should have a publications program, a library or an information service to collect and organize information. The three major research libraries in the country are the Library of Congress, the National Library of Medicine and the Department of Agriculture Library.

In addition to establishing a working mechanism to improve scientific information activities within the Federal Government, a number of direct actions have been taken by the Foundation's Science Information Service to coordinate Government information programs for maximum effectiveness.

An example in point is the coordination and administration of budget estimates and programs for scientific information activities

undertaken abroad by Federal agencies under Public Law 480 funds. We administer the program (sec. 104k) under a directive from the Bureau of the Budget and an amendment to Executive Order 10560 dated January 15, 1959.

A total of $1,200,000 was appropriated by Congress for scientific information activities under this program in fiscal year 1959.

The Library of Congress administers a separate program, section 104(n), on which we consult as to scientific information interests. Although a number of serious administrative and procedural difficulties exist, the Public Law 480 program offers the possibility of making a notable increase in the quantity of foreign publications and translations available in the United States.

Another example of coordination of scientific information activities among Federal agencies includes steps taken by the Foundation to eliminate partial duplication in five federally supported bibliographies on cold-region research. All interested agencies were called together by the Science Information Service; joint temporary support was arranged to avoid a hiatus because of an immediate financial emergency; and plans were made for a study to work out a long-range solution before fiscal year 1960.

In order to provide an effective means for the exchange of information among groups working in the scientific information field, the Foundation has begun issuance of a bimonthly news bulletin, Science Information News. This bulletin reports national and international developments, and it is hoped will assist in promoting increased cooperation and coordination among scientific information services.

Coordination of scientific information activities on a national basis: Passage by Congress of the National Defense Education Act of 1958 marked a milestone in this country's efforts to improve the availability of scientific information.

Title IX of this act, which became law on September 2, 1958, directed the National Science Foundation to establish a Science Information Service which would (1) provide, or arrange for the provision of indexing, abstracting, translating, and other services leading to a more effective dissemination of scientific information and (2) undertake programs to develop improved methods, including mechanized systems, for making scientific information available.

In addition, the act provided for the establishment of a Science Information Council to advise and make recommendations to the Science Information Service.

As one of the first steps in developing a program to provide really effective national leadership in the scientific information field, the National Science Foundation moved promptly to establish the Science Information Service and its two advisory committees.

Establishment of the Science Information Service was announced on November 16, 1958. Appointment of the Science Information Council, provided in the National Defense Education Act, was completed on December 30, 1958, and the Council held its first meeting on February 2, 1959. The Council consists of the Librarian of Congress, the Director of the National Library of Medicine, the Director of the Department of Agriculture Library, the head of the Foundation's Science Information Service, and 15 additional members drawn from various fields of science, librarianship, scientific documentation, and the lay public.

The Council, which advises on overall programs has considered a number of problems, including publication support policy, copyright of scientific information, and the mechanization of information processes.

The National Science Foundation is proceeding on the assumption that much is to be gained by close cooperation with and support of existing information services, both public and private, where they are functioning effectively. This guideline is implicit in applicable language of the National Defense Education Act and was emphasized strongly in the report of the President's Science Advisory Committee.

In this connection, I believe all will agree that the Foundation's Science Information Service is not intended to be, and should not be, a large centralized agency operated by the Government which would take over and run the scientific information services of the United States. The scientific information services rendered by many of the scientific societies and professional institutions to the scientific community are world famous for their quality. It is essential that the Federal Government continue to cooperate with and assist such private groups in the achievement of long-range solutions to the scientific information problems. After all, the scientific societies and professional institutions are the ones that know the most about these scientific information problems, and have done the basic work in this field.

The degree of organization and effectiveness of private information services varies widely from field to field, and so the Foundation has been discussing with representatives of the various societies ways and means for increasing the effectiveness of information services in each field of science.

Let me cite two examples. The Foundation provided funds and staff work for a conference of major U.S. scientific abstracting and indexing services. The major accomplishment of the conference was the formation of the National Federation of Science Abstracting and Indexing Services which strives to coordinate and improve the work of the various services and to encourage the development of abstracting and indexing services for those specialized subject fields not at present covered by such services.

The national federation has recently employed a permanent staff and working groups have started attacking problems requiring immediate attention. Major projects undertaken include compilation of a union list of journals covered by national federation members and a world list of scientific abstracting services.

As an example of efforts to improve dissemination of a particular subject field, representatives of the Foundation's Science Information Service have met with committees established by the American Institute of Biological Sciences to discuss solutions to the many problems associated with communications among biological scientists. This forward-looking effort on the part of biologists to assess present and future needs for information services represents a truly significant development.

Here is a pioneering attempt by scientists in a given field to develop a long-range and coordinated plan for optimum use of their information services. Successful development and operation of such a plan in the biological sciences would have far-reaching implications for other fields of science. The Foundation has supported the work of

the Biological Communications Study Group of the American Institute of Biological Sciences which will shortly announce their recommendations.

The Science Information Service has also worked with representatives of several other professional societies in attempting to solve particular information or publication problems.

Fields of scientific information activity: The scientific information problem which the Nation faces has two principal aspects—first, improvement of present information services which use known and tested techniques and, second, development of new and more powerful techniques for coping with the rapidly expanding body of scientific and technical literature. With regard to the first aspect of the problem, the Science Information Service functions through effective coordination and cooperative efforts of public agencies and private organizations to improve existing facilities and techniques in such a way as to measurably increase the present availability of and access to scientific information.

In the second instance, the Science Information Service encourages and supports a fundamental long-term program of research and development looking toward new and improved techniques of disseminating, processing, and searching scientific information. The ultimate goal is to insure the ready availability to all United States scientists of the world's current and past output of significant scientific information.

With this preface, I would like to indicate in brief form the fields of scientific information activity in which the Foundation has programs and the principal kinds of activity in each of these.

Documentation research: The broad objective of the documentation research program is to stimulate and support worthwhile research and studies that will lead to more efficient and more effective ways of disseminating, processing, and searching scientific information.

The research and the studies supported by this program are either fundamental in nature or are sufficiently general that the results can be expected to be of wide use to persons and organizations endeavoring to develop information systems for specific purposes.

The more immediate goals of the program are to obtain a deeper understanding of the information requirements of scientists, to compare the effectiveness of existing systems, to devise ways of using mechanical aids to help in analyzing and organizing scientific information, and to develop systems for the mechanized production of translations that may be crude in some respects, but accurate as far as they go.

The long-range goals are the development of systems, as fully mechanized as possible, for processing, storing, and searching very large volumes of information and the mechanized preparation of useful translations of foreign materials into English.

The work that has been supported to date by the Foundation falls rather naturally into three principal areas: operations research on, and studies of, present patterns of scientific communications; the organization and searching of scientific information; and mechanical translation.

A good deal of related research is being supported by a number of other Federal agencies and by private organizations both here and abroad. In order to foster cooperation and coordination among re-

searchers and laboratories working on related problems, the Foundation has taken the following actions:

1. A research information center and advisory service on information processing has been established jointly with the National Bureau of Standards and with some financial support from the Council on Library Resources.

2. Current Research and Development in Scientific Documentation is issued semiannually as a guide to current projects both here and abroad.

3. Nonconventional Technical Information Systems in Current Use reports annually on information systems embodying new principles for the organization of subject matter or employing automatic equipment for storage and search.

Another important means of fostering cooperation among researchers and supporting agencies is the research conference, and the Foundation has supported and will continue to sponsor such conferences.

Foreign science information: The fundamental objective of this program is to assure the comprehensive availability to U.S. scientists of the results of foreign scientific research. Current implementation involves conducting or supporting six principal types of activity:

1. Acquisition of foreign scientific publications otherwise unavailable in the United States; support is given to the Midwest Inter-Library Center in Chicago, a cooperative organization of 20 major midwestern research libraries, to acquire all "hard-to-get" foreign journals which are covered by Chemical Abstracts. Journals in biology have recently been added to this program which provides service on a national basis. The Foundation hopes to encourage organizations in other parts of the country to undertake similar efforts.

The Foundation is also represented on an interdepartmental committee on acquisitions which concentrates on the procurement of difficult-to-obtain foreign material in order to help make programs in foreign science more effective.

2. Translation of Russian scientific publications. Foundation support is now making possible the cover-to-cover translation of 35 U.S.S.R. scientific journals. These appear as English-language versions of the original periodicals and are offered for sale on a conventional subscription basis. It is planned to extend this program to make available selected translations of important journals from other languages such as Chinese, Japanese, Polish, and Czech. Book and monograph translation also is being supported. A report on "Providing U.S. Scientists with Soviet Scientific Information" is issued and kept up-to-date by the Foundation.

As indicated earlier, just getting underway is a project whereby foreign currencies accruing to the U.S. Government through sale of surplus agricultural products will be used to pay for foreign-language-to-English translation projects abroad. The first one is established in Israel; negotiations are now being pursued with Poland and Yugoslavia, and preliminary contacts have been made with Finland, India, and Indonesia.

3. Maintenance of information centers on translation. Clearinghouse operations of this kind enable scientists to find out what translations are available and aid them in obtaining access to copies. The Foundation is supporting, or has plans to support, projects of this

kind under the direct administration of the Commerce Department's Office of Technical Services, the Special Libraries Association, and the American Institute of Biological Sciences.

4. Investigation of the scientific information situation in foreign countries. A major responsibility of the Foundation's Science Information Service is to be fully aware of what goes on in the scientific information field throughout the world. A series of studies will provide information on the organization, characteristics, and generation of scientific information in every major area of the world. Those currently underway and planned concern Soviet Russia, Poland, Japan, Indonesia, mainland China, Czechoslovakia, Yugoslavia, and Hungary.

5. Provision of bibliographic and reference aids. Currently, such projects being supported include maintenance at the Library of Congress of a source file of Soviet information; preparation of a variety of bibliographies and accession lists; studies of the availability and use in this country of Japanese scientific literature, including serial publications in science and technology; and investigation of the foreign language-English dictionary situation.

6. Cooperation between United States and foreign nations. Separate meetings have been held by staff of the Science Information Service with representatives of the United Kingdom, Canada, Germany, the Scandinavian countries, Israel, India, Indonesia, Japan, Poland, Yugoslavia, and the U.S.S.R. to discuss, plan and, in some cases, to take immediate action on, cooperative scientific information projects.

Significant discussions have also been held with international organizations such as the International Council of Scientific Unions which is the central body for Scientific Unions in particular fields, the European Productivity Agency of the Organization for European Economic Cooperation, the International Federation of Documentation, and the Advisory Group on Aeronautical Research and Development of NATO.

The Science Information Service is cooperating with representatives of organizations in Europe looking toward the establishment of a European translations clearinghouse analogous to, and to operate in cooperation with, the Office of Technical Services-Special Libraries Association clearinghouse in the United States.

Publication and information services: In this phase of the work, temporary or emergency aid is given to primary journals and abstracting and indexing services; also, funds are provided for the preparation or publication of significant monographs, reviews and reference works which could not be made generally available without subsidy. The basic considerations under which support of this kind is granted take into account the needs of the scientific community and sound economic planning for the publication.

Examples of new and experimental types of journals which are supported by the Foundation include Physical Review Letters, published semimonthly by the American Physical Society, and Wildlife Disease, the official journal of the Wildlife Disease Association. The latter is jointly supported by the Council on Library Resources and is the first scientific journal ever to be published solely in microform.

Other efforts of the Foundation in this area concern data and information centers which compile and analyze research results, collect and organize information on research in progress, provide reference and literature searching service, et cetera. As total scientific knowledge has increased, the need for such information services has grown. Examples of support by the Foundation include the establishment of an Office of Critical Tables at the National Academy of Sciences-National Research Council to coordinate the activities of the various data compilation projects now in progress in this country and of the data centers currently in operation, and to stimulate new projects and centers in areas not presently being covered. The Foundation also joined with other Federal agencies to support the Bio-Sciences Information Exchange, which collects information on current research projects in the biological sciences, organizes and classifies this information and makes it available upon request.

The third phase of the publications and information services program involves conducting, or supporting, studies of two general kinds.

One is yardstick in nature, producing information useful in evaluating requests for publication and information center support. The other studies are conducted, or supported, in such areas as new publication methods, improved techniques of abstracting and indexing, optimum overall dissemination pattern for a given subject field, comparative usefulness of different kinds of publications, et cetera.

These have been taken up with some of the scientific societies which are now carrying on many of these studies.

In the past few years several scientific societies have established programs to assess and to try to improve the entire publications pattern in their fields. The American Institute of Physics has established, with partial support from the Foundation, a research program to study the problems of physics publication and to look for solutions to these problems. Included in the program are consideration of new types of publications, more rapid and lower cost publication methods, and studies of the publication needs of physicists. The American Chemical Society is studying new printing methods (such as the Photon) and has an active research department at Chemical Abstracts.

Unpublished research information: The Foundation seeks to increase the accessibility of unclassified, unpublished research information. The principal sources of such information are research reports and memorandums of Government and private institutions, theses and dissertations, and papers resulting from scientific conferences. Interested scientists frequently experience a great deal of difficulty in trying to locate such material, some of which may contain significant scientific information not otherwise found in published sources. There has been a great increase in activity of this kind which complicates the overall problem.

Support has been rendered to the Office of Technical Services of the Department of Commerce and to the Library of Congress to increase the coverage and availability of unclassified Government research reports to the Nation's scientists and engineers.

There is a study underway with the Department of Defense and the Department of Commerce on relations between the Armed Services

Technical Information Agency and the Office of Technical Services to determine whether such forms of cooperation as cataloging in a common system and coordinated acquisitions would not improve the services of both these important Federal information services.

The Foundation has accelerated its program for conducting inventory surveys of information activities of those Federal agencies operating major scientific information programs. As you will see, a number of very complex administrative and technical problems are involved in this whole program.

The first inventory report, covering information activities of the Department of Agriculture, has been published under the title "Scientific Information Activities of Federal Agencies" (October 1958), and another issue on the Office of Naval Research is in press. The Foundation is also planning to support studies for assessing existing means of disseminating unpublished research information and will assist in making arrangements for channeling the more important unpublished information into conventional publications.

Let me conclude this account of program actions taken and planned by the Foundation with a very short summary statement of administrative actions associated with establishing and organizing the Science Information Service. The need for staff expansion to carry out the expanded scientific information responsibilities has been attacked vigorously. On July 1, 1958, 30 positions were assigned to the Foundation's Office of Scientific Information. This number has now been doubled and it is expected will be increased further before the end of this fiscal year.

In order to initiate the development of our expanded programs, we requested and were granted nearly twice the funds for fiscal year 1959 as for fiscal year 1958. A further increase of 40 percent has been requested for fiscal year 1960 over fiscal year 1959 expenditures. However, the request for additional funds for this activity in fiscal year 1960 was disapproved by the House Appropriations Committee earlier this month. The Foundation has appealed to the Senate for restoration of this cut amounting to $1,480,000. If it stands, the reduction in funds would seriously handicap efforts of the Foundation to provide for improved scientific information services. In foreign science information, for example, the Foundation would have to curtail plans to translate Soviet scientific journals, abandon a program for translating important research results published in Communist China, and cut back the Foundation's research programs on mechanical translation.

That concludes my statement, Mr. Chairman.

Dr. Adkinson of the Foundation is with me. He is head of our Office of Science Information Service and can answer your questions in any detail you may wish.

Mr. ANFUSO. Thank you very much, Doctor, for a very fine statement. You certainly have gone a long way since the creation of this Federal advisory committee on scientific information. It was only created in January of this year. Is that correct?

Dr. WATERMAN. Yes.

Mr. ANFUSO. I am interested in the last part of your statement here which says, "The Foundation has appealed to the Senate for the restoration of this cut amounting to $1,480,000."

It was denied, you say, by the House Appropriations Committee. To your knowledge, did that ever come up before the full House?

Dr. WATERMAN. The bill did, including this provision, yes, sir.

Mr. ANFUSO. Including this?

Dr. WATERMAN. Yes, sir.

Mr. ANFUSO. When was that?

Dr. WATERMAN. I don't know the exact date. I think it was about the middle of February.

It was part of the independent offices appropriation bill.

Mr. SISK. Was that in the independent offices appropriations?

Dr. WATERMAN. Yes.

Mr. SISK. About 3 weeks ago?

Dr. WATERMAN. The House passed the bill about 3 weeks ago.

Mr. ANFUSO. I think Dr. Waterman, in the future, since this committee is vitally interested in scientific progress, it would be well if we could know in advance when a bill of that kind is to come up. We will certainly stand by you in the House.

Mr. FULTON. As a matter of fact, that is our authorizing responsibility.

Mr. ANFUSO. I think that is part of our function, and I think this committee wants more and more to get interested and keep itself interested in these matters. So if you know in advance, you have got a great team here who will fight for you.

Dr. WATERMAN. Thank you very much. It is interesting to know that.

Mr. FULTON. It is interesting to know we were able to muster more than two-thirds of the House membership to override the recommendations of the committee.

Dr. WATERMAN. This particular item allots us the same amount we have in the current year, but the amount refused was the approximately 1½ million more requested.

Mr. ANFUSO. I understand our distinguished chairman, Mr. Brooks, spoke on your behalf in the House?

Dr. WATERMAN. Yes.

Mr. ANFUSO. I think we would have gotten greater cooperation if we had known of this. I do think now the Senate will restore this cut. Is there anything you would like this committee to do before the Senate—except to indicate its endorsement of the appropriation?

Dr. WATERMAN. That is all we think is necessary. We would like very much to have this restored. We feel that with this responsibility it is very important indeed to enable us to do adequately the things I have been speaking of.

Mr. ANFUSO. I will call that to the attention of my chairman.

Mr. HECHLER. I wonder if you can supply this committee with a copy of your testimony before the Senate Appropriations Committee, asking for restoration, so we can have that available?

Dr. WATERMAN. I will be glad to.

NATIONAL SCIENCE FOUNDATION,
OFFICE OF THE DIRECTOR,
Washington, D.C., May 15, 1959.

Hon. WARREN G. MAGNUSON,
Chairman, Subcommittee in Charge of the Independent Offices Appropriation Bill for 1960, U.S. Senate, Washington, D.C.

MY DEAR SENATOR MAGNUSON: The impact of H.R. 7040 as passed by the House upon the programs of the National Science Foundation is a matter which we believe warrants full consideration by the Senate subcommittee in charge of the independent offices appropriation bill. Therefore, a hearing is requested for the purpose of providing information concerning the necessity for the restoration

of the reduction made by the House of $17.02 million below the amount requested for Foundation activities in the President's budget. It is requested that H.R. 7040 be amended as follows:

Page 24, line 1, delete "$143,273,000" and insert in lieu thereof "$160,300,000", the amount contained in the President's budget for the Foundation.

It is apparent from the House report that a primary consideration in effecting the reductions was the level of the Foundation's 1959 appropriations. Although the House bill allows an increase of $7,273,000 above the $136 million appropriated for fiscal year 1959, it is essential that recognition be given to the fact that the 1959 appropriation did not provide the level of support which was considered necessary by the National Science Board after careful appraisal of the requirements of the national scientific effort.

The estimate of $160,300,000 included for the Foundation in the President's budget was the result of many substantial compromises between the judgment of those having direct concern with the improvement of the Nation's scientific capability and those having the direct responsibility for the overall financial program of the Government. The President's budget for 1960 provides for only a minimum expansion of the National Science Foundation's programs. Many activities important for the improvement of American science have already been deferred for consideration in subsequent fiscal years. The House action in cutting $17,027,000 from the amount requested in the President's budget for 1960 will, if enacted force the deferral of additional essential activities. To accomplish the purposes for which the National Science Foundation was established requires growth in the scope and in the diversity of its programs in support of science. Delay or failure to provide the financial support for this growth inhibits the achievement of the Foundation's full potential for stimulating improvements in the quantity and quality of American science.

It is therefore requested that your committee consider the programs of the Foundation from the standpoint of the requirement to improve the National scientific capability as well as of the necessity for conserving the financial resources of the Federal Government.

The attached table shows a comparison of the National Science Foundation's budget estimate for 1960 with the allowances made in H.R. 7040. The effects of the total cut of $17,027,000 are explained by line item as follows:

BASIC RESEARCH GRANTS AND CONTRACTS

The House committee report states "* * * the amount recommended includes $60,450,000 for grants and contracts for basic research in support of science, This is an increase of $11,450,000, or about 25 percent, for this program in fiscal year 1960."

In considering this program area it should be recognized that no funds were budgeted in the fiscal year 1959 appropriation for the Antarctic research program that was funded from the International Geophysical Year appropriation in previous years. Due to the timing of the decision to support these international scientific commitments in the Antarctic, a supplemental request for fiscal year 1959 could not be submitted. Therefore, it was necessary to absorb $4 million for this program within the amounts appropriated. The House action apparently does not give recognition to this new item for fiscal year 1960.

In addition, two new programs were proposed for fiscal year 1960, a basic research program in the Arctic for $1 million and an international science program budgeted at $0.5 million. Since the House Appropriations Committee did not delete these two items it appears these two items were allowed. In effect, $5.5 million of the $11,450,000 increase, was allowed to cover programs which were not budgeted in the fiscal year 1959 program. Therefore, the actual increase for the support of basic research in the biological, medical, mathematical, physical, engineering and social sciences is only $5,950,000 over the amounts available for these programs in fiscal year 1959. This $5,950,000 increase will support only 18.3 percent of the estimated increase of $32,500,000 basic research proposals to be received by the Foundation in fiscal year 1960. The receipt of research proposals for fiscal year 1959 will be approximately $131 million and the estimated receipt of research proposals for fiscal year 1960 is $163,500,000.

The fiscal year 1959 budget, as submitted to Congress, which was substantially allowed, provided for the support of 50 percent of the estimated research proposal receipts of $80 million. As a result of an increase in the research proposal receipts from the estimate of $80 million to approximately $131 million, the absorption of the Antarctic program, and the increase in the cost of research, the Foundation will only be able to support 34.7 percent of the total dollar value

of research proposals received in fiscal year 1959. Since the House allowances only provide a nominal increase of $5,950,000, and since research proposal receipts in fiscal year 1960 are estimated to be $32,500,000 greater than in fiscal year 1959, the Foundation will only be able to support 33.6 percent of the research proposals estimated to be received in fiscal year 1960, as compared to the 39.4 percent level of support provided for in the budget estimate. The following tables illustrate the above facts:

COMPARISON OF PERCENT OF SUPPORT BY YEARS

	Fiscal year 1959	Fiscal year 1960	
		Present budget	As reduced by House
Biological and medical sciences	39.5	40.0	34.1
Mathematical, physical, and engineering sciences	32.8	40.0	34.1
Social science research	14.2	26.7	22.7
Total	34.7	39.4	33.6

COMPARISON OF NUMBER OF GRANTS BY YEARS

Biological and medical sciences	983	1,025	874
Mathematical, physical, and engineering sciences	717	880	750
Social science research	60	80	68
Total	1,760	1,985	1,692

Weather modification

The House, as indicated in the report of the Appropriations Committee on Independent Offices, specifically did not allow a $2 million request to undertake a program of research in weather modification. This program is being initiated in accordance with the provisions of Public Law 510, 85th Congress, which was originally a Senate bill. Public Law 510 stresses the approach to weather modification as a specific program entity. This is important if weather modification is to receive the special emphasis implied by Public Law 510. The Foundation supports basic research proposals on the basis of competition, in terms of scientific quality. Therefore, proposals specifically oriented toward weather modification would have to compete with all other research proposals in the physical science areas. There would be no assurance that in this competition weather modification would receive the support and emphasis implied by the provisions of Public Law 510. In order to press forward with activities directed toward progress in weather modification activities as directed by the Congress, it is essential that specific funding for this program be provided. It is requested that the $2 million for weather modification be restored for this purpose.

RESEARCH FACILITIES

The House bill specifically deletes three items which are extremely important to the Foundation's overall program of supporting improvements in research facilities for American scientists as set forth below.

Southern Hemisphere astrograph

The budget submissions for both fiscal years 1958 and 1959 included provisions for a Southern Hemisphere astrograph. In both years this item was not supported in the appropriation. It has again been included in the fiscal year 1960 budget because of its importance to the total astronomy program of the United States. The House committee, in its report, does not state specific reasons for disallowing this item.

The necessity for an instrument of this type in the Southern Hemisphere results from the need for exact measurements of stellar and planetary motions and positions in correlation with the observations at the Lick Observatory astrograph for the Northern Hemisphere. The relationship of the earth to the various stellar bodies requires that these measurements be made from the Southern Hemisphere. These measurements are extremely important to the current astronomy program and will ultimately play an important part in this country's developing space program. The $800,000 is a relatively small cost in relation

to its importance to the total U.S. astronomy and space programs. The facility, once constructed, will be supported privately, probably by U.S. universities.

University nuclear research equipment

Over the years the Atomic Energy Commission and the Foundation have developed a carefully coordinated course of action for providing support for reactors. Under this agreement the Atomic Energy Commission is responsible for taking the lead in supporting reactors for training purposes as a part of its basic responsibility for developing promising reactor systems. The Foundation is responsible for taking the lead in encouraging the construction and operation of reactors for basic research at selected universities, and therefore, the Foundation has budgeted $2 million for this purpose.

The House Appropriations Committee did not disagree with the Foundation's budget for the program to provide nuclear research equipment to the colleges and universities. However, the requested funds were disallowed on the premise that the funds could be transferred from the Atomic Energy Commission as was done last year.

For fiscal year 1959 the Senate made provision in the language of the Atomic Energy Commission appropriation for the transfer of $2 million to the National Science Foundation for this purpose. If it is considered essential to continue this expedient to cover the Foundation's fiscal year 1960 requirements for this program it would be necessary for the Senate to take identical action again this year. Since the Foundation has the responsibility, it would be preferable to restore this amount directly to the National Science Foundation appropriation. This is strongly recommended, although the expedient of appropriating $2 million to the Atomic Energy Commission for transfer to the Foundation would permit these important research facilities to be activated.

National Institute for Atmospheric Research

The atmospheric sciences are an important part of our total national scientific effort. A substantial increase in the research activity in this field will clearly yield great returns to the Nation. Recently a report was published by a committee composed of scientists from 14 major universities which was established at the request of and supported by the Foundation as a means of determining the requirements of this important field of science. This report points up many of the deficiences in the atmospheric sciences in the United States and proposes, as a partial solution, the construction of a National Institute for Atmospheric Research. In anticipation of this report, the Foundation budgeted $500,000 to perform a feasibility and planning study in connection with this proposal including consideration of the need for facilities necessary for carrying out modern research in this area. Funding for this planning and feasibility study is essential in order to assure that the National Science Foundation is in a strong position to evaluate the merits of this proposal in relation to possible alternatives and to be certain that, if the project is supported by the Federal Government, the amounts will be invested wisely.

DISSEMINATION OF SCIENTIFIC INFORMATION

The problem of improving the dissemination of scientific information has been a matter of widespread concern on the part of the American scientific community. The Congress recognized the need for greater progress in the development of a program for coordinating and supplementing American scientific information activities and enacted special legislation in this field as part of the National Defense Education Act of 1958. The National Science Foundation was given the major role in this effort in title IX of the act. In addition, Executive Order No. 10521, as amended, further details these responsibilities. In order to carry out these added responsibilities the Foundation budgeted an increase of $1,480,000 for fiscal year 1960. The House bill, H.R. 7040, does not allow for this requested increase and in effect holds this program to the fiscal year 1959 level. If this requested increase is not restored, the following will be the general effect on the Foundation's activities in this program: (1) Abandonment of plans to make additional significant Russian research information available in English translation to U.S. scientists, and the start of a new program for the translation of important work published in Communist China; (2) curtailment of essential support to primary scientific journals reporting the results of U.S. research and to abstracting and indexing services; (3) delays in research on mechanical translation projects and on mechanized information processing; and (4) reduction in support of data and reference centers to provide scientists improved access to hard-to-obtain scientific information materials.

Vigorous action by the Federal Government in this field is necessary so that U.S. scientists will not work at a disadvantage in utilizing the increasing volume of research results reported in the United States and abroad.

SURVEYS AND REPORTS

The House action reduced by $140,000 the support of scientific manpower activity, of which $100,000 was for the conduct of scientific manpower research. In addition, $65,000 was reduced from the request for surveys and reports under the support of science activity. This total of $205,000, although relatively small, represents an important part of the Foundation's programs to provide current information on the national scientific personnel resources and the research and development effort of the United States including the impact of research and development on the economy.

PROGRAM DEVELOPMENT, OPERATION, AND EVALUATION

The House action reduced the budget request to the fiscal year 1959 level, a reduction of $585,000. In effect no allowance was made to provide an essential increase in the scientific and other staff necessary to administer the programs of the Foundation. The problem has been one of recruiting the additional scientific personnel necessary to assure the effective utilization of funds appropriated for the support of science.

Based on current experience, it appears that the Foundation can recruit the additional scientific personnel necessary for the effective administration of the programs. With the restoration of the $585,000 our overhead in this activity will be only 2.7 percent of the total funds requested for the support of science.

In the above discussions those facts which appear to be most important have been outlined. It is expected that at the hearings these points will be more fully developed as necessary to provide a basis for the committee's judgment on the recommended restoration of $17,027,000.

It is recognized that for programs of this nature there are not and cannot be tangible and exact measurements of need. The Foundation's budget estimate for 1960 represents the collective judgment of the National Science Board after careful appraisal of the needs evidenced throughout the American scientific community.

Sincerely yours,

ALAN T. WATERMAN, *Director.*

42666—59——6

Comparison of NSF fiscal year 1960 budget estimate with recommendations of House Appropriations Committee

	Fiscal year 1960 estimate	House recommendation	Increase (+) or decrease (−)
SUPPORT OF SCIENCE			
Basic research grants and contracts:			
Biological and medical sciences	$27,200,000		
Mathematical, physical and engineering sciences	35,200,000	$60,450,000	−$9,450,000
Office of Social Sciences	2,000,000		
Special international programs	5,500,000		
Weather modification	2,000,000	0	−2,000,000
Subtotal	71,900,000	60,450,000	−11,450,000
Research facilities grants and contracts:			
Modernization of graduate-level laboratories	2,000,000	2,000,000	0
Biological and medical sciences	2,000,000	2,000,000	0
Mathematical, physical and engineering sciences:			
University computers	1,500,000	1,500,000	0
Southern Hemisphere astrograph	800,000	0	800,000
University nuclear research equipment	2,000,000	0	−2,000,000
Oceanographic vessel	2,000,000	2,000,000	0
National Institute for Atmospheric Research	500,000	0	−500,000
Maintenance of operation of national research facilities:			
National Radio Astronomy Observatory	900,000	900,000	0
Kitt Peak Observatory	900,000	900,000	0
Subtotal	12,600,000	9,300,000	−3,300,000
Surveys and reports	355,000	290,000	−65,000
Dissemination of scientific information	5,100,000	3,620,000	−1,480,000
Program development, operation, and evaluation	2,365,000	1,780,000	−585,000
Total, support of science	92,320,000	75,440,000	−16,880,000
SUPPORT OF SCIENTIFIC MANPOWER			
Fellowships	12,700,000	12,700,000	0
Institutes	33,050,000	33,050,000	0
Clearinghouse of scientific information	1,000,000	860,000	−140,000
Special projects in scientific education	11,600,000	11,593,000	−7,000
Course content improvement	6,000,000	6,000,000	0
Progress, development operation, and evaluation	2,249,000	2,249,000	0
Total, support of scientific manpower	66,599,000	66,452,000	−147,000
Executive direction and management	1,381,000	1,381,000	0
Total, NSF	160,300,000	143,273,000	−17,027,000

STATEMENT OF ALAN T. WATERMAN, DIRECTOR, NATIONAL SCIENCE FOUNDATION, BEFORE THE SUBCOMMITTEE IN CHARGE OF INDEPENDENT OFFICES APPROPRIATION BILL FOR FISCAL YEAR 1960, U.S. SENATE

Mr. Chairman and members of the committee, our purpose in appearing before the committee today is to request the restoration of $17 million to the fiscal year 1960 appropriation for the National Science Foundation. The House in H.R. 7040, the independent offices appropriation bill for 1960, included the amount of $143,273,000, which is $17,027,000 less than the amount requested for the National Science Foundation in the President's budget. This reduction of about 11 percent from the amount requested will, if allowed to stand, significantly affect the Foundation's capabilities for stimulating improvement in the quality and quantity of American scientific effort.

House Report No. 350 concerning the independent offices appropriation bill for 1960, H.R. 7040, states that "* * * The amount recommended includes $60,450,000 for grants and contracts for basic research in support of science. This is an increase of $11,450,000, or about 25 percent, for this program in 1960." To understand fully the need to restore the amount cut from our request by the House, it is necessary to consider the composition of this increase. First, it includes $4 million for the continuing U.S. scientific program in the Antarctic, previously supported under the International Geophysical Year appropriation but now supported entirely under the regular National Science Foundation appropriation; second, it includes $1 million for a program of basic research in the Arctic; and third, it includes $500,000 for an international science program. These latter

two items appear to be allowed since the House Appropriations Committee did not indicate deletion in the report. In effect, $5.5 million of the $11,450,000 increase was allowed to cover programs which were not budgeted in fiscal year 1959. Therefore, the actual increase for the support of basic research in the sciences is less than $6 million.

This $6 million increase for basic research will support only 18 percent of the $32 million increase in research proposal receipts estimated to be received in fiscal year 1960. The receipt of research proposals for fiscal year 1959 will be about $131 million. The estimated receipt of research proposals for fiscal year 1960 is $163,500,000. In terms of totals the fiscal year 1959 appropriation has permitted the Foundation to support about 35 percent of the total dollar value of research proposals received. With the amount allowed by the House in H.R. 7040 the Foundation will be able to support less than 34 percent of the research proposals estimated to be received in fiscal year 1960. In effect, although an increase of $6 million was allowed for the support of basic research, the Foundation will be supporting a somewhat lesser proportion of the research proposal receipts than was possible with the fiscal year 1959 appropriation.

A fundamental purpose of the National Science Foundation is the promotion of basic research. To accomplish this purpose, it appears reasonable to expect that the appropriation made to the Foundation will bear a relationship to the growth in basic research capability as measured in terms of research proposals and other factors, as well as a relationship to the appropriation for the prior fiscal year. To be given funds adequate to support only approximately one-third of the research proposals received appears inadequate to meet the Foundation's objective of promoting basic research. A large part of the two-thirds not supported represents an undeveloped potential for high-quality scientific research. Failure to develop and apply this potential to the improvement of American scientific capability is not in accord with the Foundation's basic mission nor is it in the interest of the national welfare.

The Foundation's budget request proposed to support a minimum level of approximately 40 percent of the estimated research proposal receipts for fiscal year 1960. It is essential to restore the $11,450,000 which the House reduced from our request for basic research grants and contracts if we are to provide this minimum level of support.

Included in this $11,450,000 was an amount of $2 million to provide for scientific studies concerning weather modification. This program is being developed to implement the provisions of Public Law 510, 85th Congress, originally a Senate bill. Failure to restore this $2 million will seriously handicap the Foundation in developing this program as requested by the Congress. House Report No. 350 indicates this item specifically was not allowed by the House Independent Offices Subcommittee on Appropriations. Possibly this action was based on the belief that the type of research necessary to press forward with a weather modification program could be entirely merged with the regular basic research programs of the Foundation. It should be pointed out, however, that under the terms of Public Law 510 it will be necessary for the Foundation to carry out both basic and applied research in weather modification and, in addition, to include specific evaluation of existing research in the field. Therefore, to assure adequate support of activities directed toward progress in weather modification, it is essential to provide specific funding in the amount of $2 million for this program.

In summary, the House cut in half the requested increase of $22,900,000 for basic research grants and contracts, allowing an increase of $11,450,000. We request restoration of the cut of $11,450,000 for the reasons stated.

The House action on the appropriation request reduced by $3.3 million the total request for $12.6 million for research facilities. This reduction specifically eliminated three items from the Foundation's budget request: $800,000 for the Southern Hemisphere Astrograph; $2 million for university nuclear research equipment; and $500,000 to perform a feasibility and planning study in connection with a proposed National Institute for Atmospheric Research.

Two aspects of the Foundation's budget for research facilities should be considered. First is the fact that the lack of basic research facilities curtails the Nation's ability to perform high quality basic research. In the opinion of those most closely associated with this problem action must be taken to improve our position in this regard. An increasing proportion of the Foundation's total budget should be devoted to providing these facilities. However, a decreasing proportion is revealed when we compare fiscal year 1959 with fiscal year 1960. In fiscal year 1959, $15 million was appropriated for basic research facilities. The President's budget for fiscal year 1960 included $12.6 million for basic

research facilities. The House in H.R. 7040 allowed $9.3 million, or $5.7 million less than the amount available for basic research facilities in fiscal year 1959. In these terms, support provided for basic research facilities has decreased in the face of a need for very substantial increases.

The problem, from a budget standpoint, is that requirements for scientific research facilities are evaluated on an item basis throughout the various levels of the budgetary process. In other words, scientific judgments upon which needs for research facilities are based appear not to be given sufficient weight in the process of making financial decisions. It would be more advantageous from a scientific standpoint if financial judgments on the Foundation's budget for research facilities were made in terms of total dollars rather than by specific items, thus leaving the judgment on specific items to be determined by appropriate scientific specialists.

The second and the most pressing aspect is the fact that the House action deleted three facility items which were included in the request to meet specific scientific needs of vital importance: the Southern Hemisphere Astrograph, university nuclear research equipment, and a planning and feasibility study in connection with a proposed National Institute for Atmospheric Research.

The Southern Hemisphere Astrograph is a necessary instrument for making exact measurements of stellar and planetary motions and positions in the Southern Hemisphere in correlation with observations at the Lick Observatory Astrograph for the Northern Hemisphere. Funds for this facility were budgeted in fiscal year 1958 and fiscal year 1959 and in both years the Congress has denied the request. Members of the staff of the Foundation and others concerned with the science of astronomy in the United States considered this item of sufficient scientific importance to recommend again its inclusion in the President's budget for fiscal year 1960. Although the reasons for deleting this important scientific facility in previous years were not discussed in the reports of the Appropriation Committees of the House and the Senate, it may be that the concern is with the location in the Southern Hemisphere. On this point it is important to understand that observations of the type to be performed with this instrument must be made in the Southern Hemisphere in order to achieve the scientific purposes. Countries in South America, currently being considered as possible locations for the facility, do not have the scientific or technical capacity necessary to provide the instrument or to accomplish the observations. Therefore, these responsibilities must be borne by the United States if this important scientific work is to be accomplished.

In deleting the $2 million item for university nuclear research equipment, the House Appropriations Committee did not disagree with the Foundation's request for these funds. Funds were disallowed on the premise that they could be transferred from the Atomic Energy Commission appropriation as was done last year. Over the years the Atomic Energy Commission and the Foundation have developed a carefully coordinated course of action for providing support for reactors. Under this agreement the Atomic Energy Commission is responsible for taking the lead in supporting reactors for training purposes as a part of its responsibility for developing promising reactor systems. The Foundation is responsible for taking the lead in encouraging the construction and operation of reactors for basic research at selected universities. The Foundation, therefore, budgeted $2 million for this purpose.

For fiscal year 1959 the Senate, in the language of the Atomic Energy Commission appropriation, provided for the transfer of $2 million to the National Science Foundation for this purpose. If it is considered essential to continue this expedient to cover the Foundation's fiscal year 1960 requirements for this program, it would be necessary for the Senate to take identical action again this year. Since the Foundation has the responsibility, it would be preferable to restore this amount directly to the National Science Foundation appropriation. This is strongly recommended, although the expedient of appropriating $2 million to the Atomic Energy Commission for transfer to the Foundation would permit these important research facilities to be activated.

With reference to the $500,000 item for the planning and feasibility study for the proposed National Institute for Atmospheric Research, a report was published recently by a committee composed of scientists of 14 major universities established at the request of and supported by the Foundation as a means of determining requirements in the important field of atmospheric sciences. This report points up many deficiencies in this important field of science in the United States and proposes, as a partial solution, construction of a National Institute for Atmospheric Research. The item of $500,000 deleted by the House action should be restored in order to assure that the National Science Foundation is in a strong

position to evaluate the merits of the proposal in relation to possible alternatives and to make certain that if this project is supported by the Federal Government the amounts will be invested wisely.

The problem of improving the dissemination of scientific information has been a matter of widespread concern on the part of the American scientific community. The Congress recognized the need for greater progress in developing a program for coordinating and supplementing American scientific information activities by enacting special legislation in this field as part of the National Defense Education Act of 1958. The National Science Foundation was given the major role in this effort in title IX of the act. In addition, Executive Order No. 10521, as amended, further spells out these responsibilities. In order to carry out these added responsibilities, the Foundation budgeted an increase of $1,480,000 for fiscal year 1960. House bill H.R. 7040 does not allow for this requested increase and in effect holds this program to the fiscal year 1959 level. If this requested increase is not restored, the following will be the general effect on the Foundation's activities in this program: (1) Abandonment of plans to make additional significant Russian research information available in English translation to U.S. scientists and abandonment of a proposed new program for the translation of important work published in Communist China; (2) curtailment of essential support to primary scientific journals reporting the results of U. S. research and to abstracting and indexing services; (3) delays in research on mechanical translation projects and on mechanized information processing; and (4) reduction in support of data and reference centers which provide scientists improved access to hard-to-obtain scientific information materials.

Vigorous action by the Federal Government in this field is necessary so that U.S. scientists will not work at a disadvantage in utilizing the increasing volume of research results reported in the United States and abroad.

The House action reduced the budget request for "Program development, operation, and evaluation" to the fiscal year 1959 level, a reduction of $585,000. In effect no allowance was made to provide an essential increase in the scientific and other staff necessary to administer the programs of the Foundation. The problem is one of recruiting additional scientific personnel necessary to assure the effective utilization of funds appropriated for the support of science. With restoration of the $585,000, our overhead in this activity will be only 2.7 percent of the total funds requested for the support of science.

The House action reduced by $140,000 the "Support of scientific manpower" activity, of which $100 000 was for the conduct of scientific manpower research. In addition, $65 000 was reduced from the request for "Surveys and reports" under the "Support of science" activity. This total of $205,000, although relatively small, is an essential part of the Foundation's programs to provide current information on the national scientific personnel resources and the research and development effort of the United States, including, importantly, the impact of research and development on the economy.

I have discussed those facts concerning the Foundation's budget which appear to be most important. I recognize that for programs of this nature these are not and cannot be tangible and exact measurements of need. The Foundation's budget estimate for 1960 represents the considered judgment of the National Science Foundation, including full endorsement by the National Science Board, after careful appraisal of needs evidenced throughout the American scientific community.

Mr. FULTON. Do you believe the cuts that have been made in the National Science Foundation funds for the coming fiscal year will actually imperil the scientific translations you believe are necessary—and I use the word "imperil" on purpose—in other words, that it is a severe cut and that it badly hurts the program?

Dr. WATERMAN. I believe, as I have said, that it will prevent our doing some additional things which I think are really important.

Dr. Adkinson, would you care to add to that?

Dr. ADKINSON. It is awfully hard to assess the difference between "hurt" and "imperil." "Imperil" is a pretty strong word.

Mr. FULTON. I wish you would be definite. I want to quote you, and when you act unsure it hurts your case.

Dr. ADKINSON. I don't think it imperils our existing program.

Mr. FULTON. If you think there is some fine distinction between "imperil" and "hurt," you had better make it clear or else ask somebody else to fight for restoration of the cut, but if you think the money is necessary because it "imperils" it, you will get strong support from some of us who want it done.

However, if you are uncertain, the Appropriations Committee may be right.

Dr. WATERMAN. We think this is very necessary to do some additional important things we have planned.

Mr. FULTON. Let's be more specific. There are about 70 Russian journals to be translated, of which the Science Foundation is going to translate 35.

Dr. ADKINSON. There are 70 journals being translated, of which the Government is translating 35. We want to translate 45.

Mr. FULTON. How many is the Government translating?

Dr. ADKINSON. Thirty-five of the forty-five.

Mr. FULTON. But you want to increase your share to 45, do you not?

Dr. ADKINSON. That is correct; if we can.

Mr. FULTON. There are 200 scientific journals now being received from Communist China, and in your new program you want to translate about 5 of those?

Dr. ADKINSON. We want to start a program to experiment in this field of translating. We hope to get three to five going this year. We have to do the same thing in the Chinese field as we did in the Russian field several years ago; namely, to ascertain the best way to do the translating, whether cover to cover or through making selections, and in what field there is the greatest need. That is the pilot project we would like to start this year and to have funds for that purpose.

Mr. FULTON. The National Science Foundation program vis-a-vis the Chinese information documents being received in the quantity of 200 is only about 5 of the total 200, so you are just taking a nibble at it.

Dr. ADKINSON. That is correct.

Mr. FULTON. There are 450 scientific documents and journals coming out of Communist China today, are there not?

Dr. ADKINSON. We know of 456; that is right.

Mr. FULTON. So unless we take action now and do this translating, we might find ourselves in the same position with regard to Communist China that we were in regard to Russia. We underestimated them and have not moved along in the scientific fields and given our scientists the chance to progress that they might have had.

Dr. ADKINSON. There are several aspects in making information——

Mr. FULTON. Would you answer that specifically first and then comment?

Dr. ADKINSON. That is true.

Mr. FULTON. We might be caught on Communist China on scientific information just as we were caught in Russia in the past?

Dr. ADKINSON. I firmly believe so.

Mr. FULTON. Now, would you explain?

Dr. ADKINSON. There are several activities that go to making information available to the scientists and engineers of this country. Translation is only one of them. There is a previous step that is

important; namely, the abstracting of these foreign journals in the standard abstracting and indexing services so the working scientists can follow that information. This is a very important step to get done. A large information program started here from nothing and expanded rapidly might be a lot of waste effort and waste some of the scientific personnel that has Chinese language capability on translating when it might be better to do abstracting.

This is a case of alerting the scientists to what is going on in China first and then doing the translating. We publish between 2,000 and 3,000 scientific and technical journals in this country, but a person does not have to follow all the journals in the field. He follows the significant ones. This is what we want to do in the translation field—get the few significant ones that are in each field translated so the scientists and engineers can follow those.

We are only doing 70 in Russia and some say there are 2,000 in this field, but we feel we are coming close to getting the essential journals done.

I don't think we need to translate 2,000. We would flood the scientists with too much information.

Mr. FULTON. But there is in the neighborhood of 100 from Russia for the coming year of which you and the National Science Foundation want to translate 45.

Dr. WATERMAN. That is right.

Mr. FULTON. What reason was given in the Appropriations Committee report for making this cut in the National Science Foundation?

Dr. WATERMAN. As far as I recall, there was no reason stated in the report.

Mr. FULTON. Was it simply for economy reasons rather than that it was not necessary for the scientific progress of the United States and our security? There was no specific finding it was not necessary?

Dr. WATERMAN. That is right.

Mr. FULTON. I have some good news for you. I have been working on the Mutual Security Act for 1959, on the Foreign Affairs Committee, and under section 401(b) amending section 502, I have inserted a new amendment which states notwithstanding any provision of law the President is authorized to utilize foreign currencies available to the United States from any source for scientific research and development and for the translating of scientific books and treatises. That amendment has passed the House Foreign Affairs Committee unanimously and now is in the mutual security program for 1959 which will come before the House June 8. I want to alert all our committee members of this.

I might add this authorization to the President is an authorization which in no way has any effect upon the House Appropriations Committee. The President can use discretion in allocating funds. The second point is that the funds can come not only from counterpart funds generated from the mutual security program, but also from funds available through the disposal of U.S. agricultural surpluses abroad under Public Law 480. It says funds available to the United States and means any funds that might become available under any programs that might be set up which generate foreign funds that we either direct the use of or control, jointly or otherwise.

It would also include any foreign funds that might be in the U.S. Treasury, in a general account, without an obligation having been

made against them as yet. So under this amendment any unobligated foreign funds available to the United States from any source are available to the President. In further explanation it means that they are not to be charged against the fiscal year budget of any agency or branch of the Government, so you do not get into the position where the Appropriations Committee is saying to them, "We will subtract an equivalent number of dollars from your agency budget, when you take these foreign funds."

It puts it on an all-Government basis. I would like you people to look into the problem of how it should be set up, if it passes in the Mutual Security Act. As I say, I had already cleared it, recommending it to our chairman here. He said that he would not disagree with the position I was taking.

Dr. WATERMAN. It is good news. This would help us out of a good many difficulties we have been in. Thank you.

Mr. ANFUSO. It is a very excellent amendment and the gentleman from Pennsylvania is to be commended.

Mr. FULTON. Thank you. The main point I want to make is that it is not done under appropriation procedure, but at the discretion of the Executive who might set up an agency or agencies to carry out his intent. It would be simply the President accounting for the use of the funds as he accounts for the use of special funds given to him under the mutual security program. He can spend them as he believes necessary. So that avenue should be explored, if you will, and I want to put our committee on notice that we have a real stake in this mutual security bill coming up.

If we can pick up these funds of various types, for both research and development, as well as the translating of scientific books and treatises, it gives us a chance to support many universities, scientific institutes and foundations, as well as scientists in many foreign countries that we feel should be taken care of, rather than have them go over to the other side.

So it is a broad field and if adequately explored can be utilized. I hope you will look into that.

Dr. WATERMAN. We certainly will.

Mr. ANFUSO. I know as a member of the Agriculture Committee the sale of agricultural surpluses under Public Law 480 has made available huge amounts of counterpart money and what better use can we find than this method?

Therefore, I think the gentleman from Pennsylvania should be commended and I am glad he is on the Foreign Affairs Committee, and on this committee.

Mr. FULTON. And on your subcommittee.

Mr. ANFUSO. Dr. Waterman, could you tell me, if you know, the percentage of American scientists that speak Russian?

Dr. WATERMAN. About 2 percent, I think.

Mr. ANFUSO. Only 2 percent.

Dr. WATERMAN. Yes.

Mr. ANFUSO. Do you have an estimate of the number of Russian scientists who speak English?

Dr. WATERMAN. About 50 percent as far as we can tell, so that is a great advantage they have. After all, in order to get an accurate view of what is going on in science where the results are reported in another language, it is a great help to be able to read it directly and not to have to go through a third party.

Mr. ANFUSO. Do you believe, Dr. Waterman, that the Russians have scientific information which they do not publish?

Dr. WATERMAN. Yes indeed.

Mr. ANFUSO. They would classify that. Is that correct?

Dr. WATERMAN. I believe so.

Mr. ANFUSO. And, of course, under their system of government they would be able to control and see to it that no information was disseminated if they did not want it disseminated?

Dr. WATERMAN. That is right.

Mr. ANFUSO. On the other hand, whatever information we do have, scientific or otherwise, is given wide publicity, not only in our newspapers and periodicals, but in scientific magazines, and those are all available to the Russians?

Dr. WATERMAN. Yes.

Mr. ANFUSO. Have you any idea of the methods which the Russians use to translate scientific information from other countries—what resources that they have at their disposal for that purpose, what money they spend, et cetera?

Dr. WATERMAN. Would you answer that, Dr. Adkinson?

Dr. ADKINSON. I cannot give you the amount of money and I do not know the total number of people that are engaged in this translating business. We know that they are translating close to 200 of our scientific journals, technical journals, which they are distributing. We also know they are doing a mass job of abstracting the journals, not only from our country but from all other countries. We are also aware of the fact that they are taking some of our books and republishing them, sometimes in English and sometimes in translation and making those available in their country.

This is not done in one centralized place. A large effort in this field goes on in the Academy of Sciences but you will find in the ministries they have some indexing and abstracting effort so we do not have a clear picture of all the methods they use. We do know the effort is very large. We also know from the reports coming out of Russia, the Russian scientists and engineers are not happy with it because it is too slow and the wrong material is translated in many cases.

I have an article which came to my attention recently in one of their journals in which the scientist at a rather high level was complaining about the fact the translations were slow, inadequate, and the quality of material selected to translate was bad. We are aware of the fact that Russian abstracts of English-language periodicals in the field of electronics in 1957 have not been published in 1959. So they are having their troubles with the translation problem.

But they are doing a tremendous job, and 50 percent of the scientists are able to read English, which is a big lead. This saves a lot of work we would have to do to have the comparable Russian material in the hands of our scientists so they can use it.

Mr. ANFUSO. You are trying to become more selective?

Dr. ADKINSON. That is correct.

Mr. ANFUSO. How will you know what is proper and necessary unless you read all of their magazines?

Dr. ADKINSON. The way we handle this is to cooperate with the scientists in the scientific societies and in the universities, and there are a good number in this country. Two percent able to read Russian

does not sound like very many, but that is several hundred in this country. We are working with these people who are following this literature and indicating what books and periodicals should be translated. These universities or societies are coming to us and asking for money to help do this work. The British are also cooperating. They are translating 15 in the technical field and are going to add 7 more, which makes a total of 22. They are also discussing with us a cooperative program in the Chinese field.

Mr. ANFUSO. In other words, you are thinking of some form of international cooperation in this field?

Dr. ADKINSON. I think that is the only way we can get the job done.

Mr. ANFUSO. You are going to get the cooperation of various nations of the free world, say France, Britain, the United States, Italy, and many other countries. You want to get them together and plan methods by which all this information throughout the world can be translated.

Dr. ADKINSON. It is going further than that, sir.

Mr. ANFUSO. How far is it going?

Dr. ADKINSON. We are now in the process of discussing with the Poles—and they are ready to sign a contract with us—their furnishing us with English abstracts of their scientific and technical periodicals. The Poles are ready to do that and so are the Yugoslavs.

The Chinese Communists have put out five series of abstracts in fields of science in English, so we use them. We are getting cooperation not only from the free world, but from some of the countries behind the Curtain.

Mr. ANFUSO. What checks and balances are exhibited with that kind of system? We have to be careful we don't get a so-called snow job.

Dr. ADKINSON. That is one thing we have to be very careful of. We depend upon our scientists with foreign language background and scientists in other countries to follow the journals. We are continuing to get the Polish journals, for example: I might point out that a man who reads Polish would much prefer to read the original article than the translation. The translation is not always as good as the original in many cases.

Mr. ANFUSO. For example, do we have some Polish refugees in this country or in England who have scientific backgrounds and whom we can use?

Dr. ADKINSON. They are being used at the present time in abstracting activities in this country. They are being used in Europe, also.

Mr. ANFUSO. I know there are some Russian scientists in England. Are they being utilized?

Dr. ADKINSON. Yes; and there are many people here from Russia.

Mr. ANFUSO. All of that, of course, involves international cooperation.

Dr. ADKINSON. Yes.

Mr. ANFUSO. Have you had any need to sort of adopt an international program in this matter?

Dr. ADKINSON. The European Productivity Agency called together representatives of 17 different countries in Europe, meetings which I attended.

Mr. ANFUSO. When was that?

Dr. ADKINSON. They have had three now. The last one was in February, I believe, of this year—February or March.

There is a large amount of translating going on where a country needs a given article a scientist has found or part of an article or part of a book. These are ephemeral things and hard to collect. In this country we have the Office of Technical Services and the Special Libraries Association collecting these. The European Productivity Agency called the 17 countries together. They have agreed to cooperate and pool their translations. And a large number, to my surprise, are going to be in English. That is a common language most can read. The Dutch are going a large amount, the Germans some, and the Swedes also. Of course, the English will do it. We have a cooperative arrangement and we have a man in Europe now working with the EPA helping to get this translation center operative, and the British have indicated they are willing to underwrite the cost of this center.

So it is not going to mean a subsidizing by the U.S. Government. We will make our translations available to them and they will do the same for us. So it is not a subsidy from here.

Mr. ANFUSO. By that kind of cooperation you are establishing the English language as the scientific language of the free world?

Dr. ADKINSON. We hope this effect will accrue. I might tell you along that line, the man who is in charge of the information work at the All-Union Institute of Scientific and Technical Information at Moscow was in this country in November and visited with us—I visited with him quite some time. He made the statement; "If you, your country and my country, do not cooperate in this business of establishing an international scientific language, in another generation we will all be reading Chinese."

Mr. ANFUSO. Chinese or Russian.

Dr. ADKINSON. He said Chinese. He didn't say Russian. He was trying to get me to agree to go before international meetings and establish Russian and English as the two official scientific languages.

Mr. ANFUSO. Would you do this committee a great favor and give us the agenda of this conference that you had, the program——

Dr. ADKINSON. I can send it to you. I do not have it in mind here.

Mr. ANFUSO (continuing). What you accomplished and what you sought to accomplish, because we have a committee here and this subcommittee is very much interested in that.

Dr. ADKINSON. We will be glad to send you the papers which show the agenda for these conferences and the results. We will be glad to do that.

(The matter referred to follows:)

NATIONAL SCIENCE FOUNDATION STATEMENT ON OFFICE OF SCIENCE INFORMATION SERVICE INTERNATIONAL RELATIONS

In the course of developing its foreign science information programs, the Office of Science Information Service has established and maintained a variety of contacts with other scientific and political organizations with international interests. For purposes of convenience these organizations are developed in the following categories: (1) U.S. agencies with international programs; (2) national and international agencies overseas; and (3) agencies within Iron Curtain countries.

1. U.S. agencies with international programs

Since the Department of State has the primary statutory and executive authority for representing U.S. interests in other countries, and since the Department has been generous in making its services available to the National Science Foundation, the OSIS has followed a practice of channeling many of its oversea operations

through various agencies of the Department and of keeping the Department informed about its oversea activities. The Office of the Science Adviser has been particularly helpful, as has Foreign Service staff attached to geographic area desks. The Office of Intelligence Resources and Coordination, with its program for acquiring foreign publications for U.S. official uses, has similarly been cooperative.

The passage of an amendment to the Agricultural Surplus Commodity Act authorizing the expenditures of foreign currencies for translation, and the close liaison established with the European Productivity Agency, reported below, have made frequent contacts with the International Cooperation Agency essential. This Agency has been most helpful in assisting the Office to start its programs. The U.S. Information Agency operates programs for the shipment of American-produced scientific information overseas and has, therefore, a complementary program to OSIS; cooperative planning will be undertaken as OSIS discharged its mission for the mutual interchange of scientific information.

The U.S. Regional Organizations Office in Paris is responsible for American participation, both formal and informal, in a large number of international activities. This Office collaborated with OSIS in the drafting of proposals to the European Productivity Agency, described below, and has been most helpful in keeping the Science Foundation informed concerning developments in NATO and comparable organizations.

Finally, the National Research Council/National Academy of Sciences maintains a traditional International Relations Office with which OSIS is in frequent contact. This Office is invaluable as a source of specialized knowledge and has a mechanism for sponsoring quasi-governmental programs in the international field. For example, American representation on the International Council of Scientific Unions, which sponsors international cooperation in scientific abstracting, is undertaken through the National Academy of Sciences.

2. National and international agencies overseas

OSIS participation in the work of international agencies is motivated by several factors. In several enterprises (for example, the pooling of scientific translations) OSIS can insure that the United States profits by actions undertaken cooperatively in other parts of the world. In other cases (for example, the International Federation for Documentation) it is incumbent on OSIS to assume leadership, so that American preeminence in science information technology can be shared to the profit both of other countries and ultimately of the United States. In still other cases it is essential that OSIS be currently informed of developments overseas which may have an effect on the development of American programs.

Among the international agencies with which the Office has established contacts are the following:

(*a*) *European Productivity Agency.*—At EPA request OSIS has developed proposals for the more effective utilization of Russian scientific information. At the present time an OSIS staff member is on loan to the EPA to assist in the development of plans for a European pool of scientific translations to which member states may contribute. This pool would also exchange translations with the U.S. pools of scientific translations, thereby enhancing the resources of both.

(*b*) *UNESCO.*—UNESCO is in process of establishing an advisory committee to be formed from two earlier groups: Committee on Bibliography and Committee on Documentation and Terminology in the Pure and Applied Sciences. OSIS is maintaining liaison with this group, which will advise UNESCO in matters concerning scientific literature.

(*c*) *International Council of Scientific Unions.*—This agency has concerned itself with the coordination of American scientific abstracting services, and most particularly the exchange of prepublication abstracts among its members as an economy measure. OSIS has attended meetings and lent its support to this activity.

(*d*) *International Federation of Documentation.*—This organization, composed of representatives from the national documentation and science information centers throughout the world, is in process of reorganization. OSIS has supported its development as an international clearinghouse for the field of scientific documentation. Dr. Burton W. Adkinson, Head, OSIS, is currently vice president of FID and will attend its next meeting in Warsaw in September 1959.

(*e*) *International Atomic Energy Agency.*—Through its Commonwealth representative, Dr. John E. Cummins, OSIS maintains relations with this international agency located in Vienna.

(*f*) *Department of Scientific and Industrial Research, United Kingdom.*—OSIS has close relations with the headquarters office of the Science Lending Library,

United Kingdom, which has an overall responsibility for the development of science information and translation services. The translation programs in particular are closely coordinated; the possibility of joint programs in translating Iron Curtain and Communist Chinese material have been discussed.

In addition to the agencies cited above, OSIS program officials have established relations with documentation agencies or special information research centers in a large number of other countries. For example, conversations have been held with representatives of the Japan Science and Technics Agency, responsible for scientific documentation in Japan, and with the heads of technical information centers in Mexico, Brazil, and Argentina. A cooperative program with the Scandinavian Council for Applied Research, calling for the distribution of a directory of scientific information services in Scandinavian countries and the possible extension of Russian scientific translation programs has been discussed. Representatives from OSIS have attended and presented papers at international congresses on scientific information, mechanical translation, and the like. OSIS has made grants to two agencies in the United Kingdom, the Language Research Center at Cambridge University, and the Classification Research Group under the Association of Special Libraries and Information Bureaux in London.

3. Agencies within Iron Curtain countries

The scientific information systems of Iron Curtain countries and Communist China have received considerable press attention. OSIS has not only compiled considerable factual information about them, and initiated studies to evaluate their effectiveness, but has also established direct contact, and in some instances has initiated cooperative programs. Examples of such contacts follow:

(*a*) *All-Union Institute of Scientific and Technical Information, Academy of Sciences, U.S.S.R.*—On the occasion of the International Conference on Scientific Information in November 1958, OSIS invited Prof. A. I. Mikailov, director, All-Union Institute of Scientific and Technical Information, and Dr. O. A. Mikhailov, director of Scientific and Technical Information of the State Scientific and Technical Planning Committee, into its office to discuss the exchange of scientific and technical publications between the United States and the U.S.S.R., and information on the organization of scientific information systems. Also discussed was the possibility of international agreement in the transliteration of Cyrillic characters. The Russians discussed their activities freely and extended invitations to OSIS staff to visit the All-Union Institute.

(*b*) *Central Institute of Scientific and Technical Documentation, Poland.*—Following preliminary negotiations, OSIS has now established a contract with this institute for the translation of Polish scientific materials into English. Relations with this group, and with the Academy of Sciences of Poland, both of which are anxious to communicate the results of Polish scientific research, have been cordial.

(*c*) *Center of Technical and Scientific Documentation, Yugoslavia.*—Preliminary negotiations have been initiated for the translation of Yugoslav materials into English. OSIS has also established contact with the newly established Federal Council for Scientific Work, and the Bibliographic Institute, in Yugoslavia. As in the case of Poland, all three of these agencies are anxious to cooperate with OSIS in order to bring the contributions of Yugoslav science to the attention of the English-speaking scientific world.

In the nonsensitive, basic science areas with which OSIS is concerned, the common bonds of the scientific fraternity appear to be far stronger than political considerations. Countries behind the Iron Curtain appear to be most anxious to have the works of their scientists receive due and proper recognition, and for this purpose to cooperate fully with the National Science Foundation in its efforts to achieve free and open communication in the sciences. There is every reason to expect that the newly established Institute of Scientific Information of the Academia Sinica, Peking, upon direct approach, will respond in a similar manner.

Mr. ANFUSO. Thank you. Are there any questions?

Mr. VAN PELT. Dr. Waterman, getting back to this cut, was that a cut in the total budget request or did you get the amount requested?

Dr. WATERMAN. No, it was a cut below the budget request; what we have been allowed by the House is the same amount we have had for the current fiscal year—no increase has been authorized.

Mr. ANFUSO. In other words, the President had it in his budget request?

Dr. WATERMAN. That is right. In round numbers our request was $5.1 million and what we received was $3.6 million. So you see, it was about a one-third cut, or rather a refusal to increase the program by 40 percent.

Mr. ANFUSO. Were there hearings before the Appropriations Subcommittee?

Dr. WATERMAN. Yes, there were and we spoke especially about scientific information as being an important field.

Mr. ANFUSO. Are there any other questions?

Mr. HECHLER. Dr. Waterman, I want to comment on Mr. Fulton's interchange with you. I do not think that we on this committee should try to push you to the point of saying this cut imperils your program, if you believe it could better be described by a milder word. I believe it is incumbent upon Members of Congress to stimulate a frank exchange with the executive agencies, and if we give the impression that executive agencies are not going to get any money unless they scream and press the panic button, I think we are both doing a disservice to the American taxpayer.

Mr. ANFUSO. Will the gentleman yield?

Mr. HECHLER. Yes.

Mr. ANFUSO. Dr. Waterman did say it would seriously handicap the efforts of the Foundation.

Mr. HECHLER. You will recall that Mr. Fulton pushed him rather far to indicate it imperils the program rather than hurts, and I believe Dr. Waterman at first expressed some reluctance to say it imperils.

My only point is, we should not force the executive agencies to use extremes in their statements. We are all trying to stimulate a franker exchange on precisely what is needed.

I would also like to rise to the defense of the Appropriations Committee——

Mr. ANFUSO. Is this off the record?

Mr. HECHLER. This is on the record; in respect to another question that Mr. Fulton asked.

He asked if this cut was, quote, "simply for economy reasons."

I would like to suggest that economy reasons in the eyes of the Congress and this committee are very, very important, and we are deeply concerned with economy.

I would like to commend, along this line, the statement at the top of page 8 of your prepared statement that the Science Information Service was not intended to be and should not be a large centralized agency operated by the Government which would take over and run the scientific information services of the United States.

I think that is a very fine statement. You also mentioned there were some 17 Federal agencies involved and represented on the Council which you suggested be established.

Dr. WATERMAN. Yes.

Mr. HECHLER. I wonder if you would supply to this committee for the record some examples of economies which this Council has either succeeded in achieving or hopes to be able to achieve by reason of establishing this Council?

All too often, when a Council or an interdepartmental committee or a conference of this nature is established, it merely pools the information of what the agencies are doing without actually making progress toward economy.

I think it would be very useful for this committee if you could supply for the record what economies you believe this committee has achieved or what you think it will be able to achieve in the future.

Dr. WATERMAN. Yes, sir. Of course, what we hoped to achieve by use of this interdepartmental committee was to be sure that the activities of the different agencies do not overlap and duplicate.

By the use of this committee, responsibilities can be agreed upon which will be mutually helpful and understood by everyone. In that sense everyone achieves much better collaboration without useless activity and expense.

THE FEDERAL ADVISORY COMMITTEE ON SCIENTIFIC INFORMATION

The Federal Advisory Committee on Scientific Information (FACSI) was created to provide a forum for interchange of advice and opinion between Government agencies and the Foundation's Science Information Service. Through this Committee, representatives of 17 Federal agencies are brought into contact to assess the Government's progress in improving the availability of information for American scientists; to plan the strategy of attack on defects to be remedied; to publicize the efficiencies accomplished by individual agencies; and to induce a self-appraisal of each agency's contribution to the overall Federal effort. Briefly, the role of FACSI is to consult with, and to make recommendations to, the Foundation's Science Information Service on policies and programs for effecting coordination of activities of Federal agencies in the field of scientific information.

Executive Order 10807 of March 3, 1959, revoked Executive Order 9912 of December 24, 1947, which had established the Interdepartmental Committee on Scientific Research and Development (ICSRD). Various subcommittees of ICSRD had been concerned with scientific information, and a Subcommittee on Foreign Scientific Information had met frequently at the Foundation to consider problems and factors of common interest to several Government agencies. ICSRD and its subcommittees were terminated by the issuance of Executive Order 10807.

Since the establishment of FACSI on January 20, 1959, two meetings have been held at the Foundation, and a third will be held on June 30, 1959. Meetings thus far have been devoted to organization, exchange of information on various agency activities, and the appointment of subcommittees.

FACSI's role

The full responsibility for coordinating Federal activities in the field of scientific information has been vested in the NSF's Science Information Service (SIS). The plan approved by the President was that the Foundation expand this Service in such a manner as to strengthen rather than supplant existing governmental and private efforts through cooperation and coordination, and to initiate a comprehensive program to improve primary and secondary publications, scientific data and reference centers, unpublished research data, translation programs, storage-and-retrieval methods, and mechanical translation devices. In each of these areas SIS was to provide or arrange for provision of acquisitions and reference materials; to evaluate the coverage of existing programs for the purpose of avoiding duplication; to appraise the efficiency of existing programs and provide for research into methods to improve their efficiency; to stimulate cooperation between United States and foreign scientific information organizations; and to inform the scientific community of these activities and services. Substantial economies should result from the execution of this program by the Foundation's Service, of which FACSI is a helpful arm.

Examples of accomplishments

Steps have been taken to eliminate duplication in five federally supported bibliographies on cold-region research. All interested agencies were called together by the SIS, and joint temporary support was arranged to meet an immediate financial emergency. Plans were made for a study seeking a long-range solution to this problem.

Another example, which already has been cited to the House Committee on Science and Astronautics, is that of coordinating budget estimates and programs for scientific information activities undertaken abroad by Federal agencies under Public Law 480 funds. The SIS administers the program (sec. 104k) under a direc-

tive from the Bureau of the Budget and an amendment to Executive Order 10560 dated January 15, 1959. A total of $1,200,000 was appropriated by Congress for scientific information activities under this program in fiscal year 1959.

Another example of interdepartmental cooperation enhanced by FACSI involved the Armed Services Technical Information Agency (ASTIA) and the Department of Commerce's Office of Technical Services (OTS). A Study Group on ASTIA–OTS Relationships had been established in 1958 to assess the operations of these two centralized scientific information services, and had recommended certain improvements in the respective activities. Under date of January 30, 1959, the Secretary to the ASTIA–OTS Study Group forwarded to the attention of FACSI a memorandum suggesting that FACSI assume certain problems which had come to light in the course of the group's operations. The memorandum stated:

> Of the various problem areas identified and reviewed, it was the group's opinion that several were completely within the scope and capacity of ASTIA and OTS to study and resolve through their own mutual efforts, while others warrant the cooperative attention of additional departments and agencies directly involved. In this latter respect we consider the establishment of the Federal Advisory Committee on Scientific Information most *timely. The group feels that your Committee represents a most* appropriate and promising medium for the type of cooperative effort called for by the President in his strong plea of December 7, 1958, to improve our national capabilities and progress in the handling and dissemination of scientific and technical research information.

Thus, at its second meeting, on March 17, 1959, FACSI entertained the request *of the study group, and it was agreed that FACSI would assume responsibilities* as requested. Principal items proposed by the group and accepted by FACSI for consideration were: (1) Federal agency field office scientific information services; (2) effects of the inaccessibility of unclassified research information resulting from Government laboratories or research contracts; and (3) the need for standardization of report format and handling procedures. The chairman of FACSI appointed a subcommittee to look into the first, and took the other two matters under advisement.

A recent opportunity presented itself for coordination of efforts of Government agencies by FACSI; namely, arranging for joint support of the Meteorological Society's publication, Meteorological Abstracts and Bibliography. It came to the attention of SIS that the Air Force Cambridge Research Center was withdrawing support in the neighborhood of $60,000 from Meteorological Abstracts and Bibliography, which heretofore had been rendered by the Air Force on an annual basis. Representatives from several Government agencies interested in this publication were invited to the Foundation, and the support of the publication was considered as well as improvement in the quality of its services to meet slightly variant demands. This event illustrates the role that FACSI is intended to fulfill, namely, that of coordinating interagency undertakings involving a project of common interest in such a way as to not merely sustain the project, but also to improve it.

In cooperation with other Federal agencies, there was established a clearinghouse for information on research in the field of information-processing (including mechanical translation) and for a consulting service available to Federal agencies and research groups.

The Foundation joined with other Federal agencies in supporting the Bio-Sciences Information Exchange, which collects information on current research projects in the biological sciences, organizes and classifies this information, and makes it available on request.

The Harvard Business Review for May–June 1959 (p. 33), carries an article titled "Looking Around: The Company Library," by Irene M. Strieby, Library Consultant, Eli Lilly & Co. (formerly president of the Special Libraries Association). At the very beginning of her article, she wanted to be—

> * * * perfectly clear about one vital point: a good company library is not *inexpensive. Helpful information costs money; efficient facilities cost* money; an alert, well-trained librarian costs money. So it is quite natural that one of the first questions businessmen ask is the eminently practical one: "Is it worth the cost?" This question cannot be answered with graphs, *charts, or rule-of-thumb cost figures. I can only help the businessman to* find an answer by suggesting some questions he should ask himself:
>
> How much of the research done by executives and by scientists in my company is unnecessary because someone else has already done *it? * * **

> How much time and money do executives in my company devote to telephoning around the country seeking information before making important decisions? * * *

In her article, the author pictures the company library as occupying—

> * * * a strategic spot in the organization—one where it can function effectively for all parts of the business * * *

in order to provide a "companywide information program." Consequently, her cogent reasoning relative to a company library as being an information center of great use to all parts of the business is applicable to the question of economies to be looked for from the operations of the Foundation's Science Information Service.

Anticipated economies

The economies to be expected from improvements proposed and accomplished by the Foundation's Science Information Service as assisted by FACSI are indeed difficult to calculate, but they can be of considerable magnitude. Since the flow of research information affects the rate of scientific progress in all fields of research and development, an improvement in the Government's effort in this sphere will be one of great value to the Nation's economy. It can be expected that the benefits of such improvement will include savings of research manpower, time, and money.

It has been stated that a significant improvement in the dissemination of scientific information would have a decided effect in increasing the supply of research scientists and engineers. This would be accomplished by a reduction in the time now expended in information seeking (as high as 35 percent in some fields) and by a saving of that time now wasted in inadvertent duplication of work already reported elsewhere but inaccessible, or available for use only after long delays. In the article referenced above, Miss Strieby states:

> * * * the best collection of materials is of little value unless those who need it know that it is available. Here is the kind of thing that can happen:
>
> > A company librarian was told by a chemist in a steel rolling mill about an experiment which had solved a problem at a cost of $10,000. The librarian told him that the Germans had conducted the same experiment, arriving at the same conclusions, and that their complete report was on file. This report on the library shelf probably cost less than $5 when purchased; it brought the total cost of the data to $10,005 * * *.

A Government scientist recently notified the Foundation that he had suspended a new project in acoustics research as a result of having read a report of an almost identical project carried in Soviet Physics-Acoustics, a translation of the Russian Akusticheskii Zhurnal. This Russian journal is now regularly translated by the American Institute of Physics with the financial support of the Foundation and the Office of Naval Research.

The time to be saved through better information services is that gained by shortening leadtime between the initial concept and the production line. This is applicable not only to military activities but to our civil economy as well. The length of time between the laboratory and drawing board, where ideas rather than physical materials are involved, is greatly affected by the availability and adequacy of research information.

In Senate hearings of May 1958,[1] it was estimated that the Government and industrial organizations would pay between $2 billion and $2½ billion during 1958 for the use of extant scientific and technical knowledge. Although this figure cannot be confirmed, it is certain that large savings can be realized by improving the channels of technical communication in the Government agencies and by making easier the job of searching the record.

It is estimated that the U.S. Government alone spends about $100 million annually in direct preparation, publication, collection, origination, and distribution of scientific and technical information. Agencies having major programs are AEC, Agriculture, CIA, Commerce, Defense, HEW, Interior, Library of Congress, NASA and NSA.

Mr. HECHLER. I think that is a very worthy objective.

I would like the record to show also that members on this side of the table are not all "radical spenders."

Dr. WATERMAN. Yes. Dr. Adkinson can give you just offhand a couple of illustrations and we can give you more for the record.

[1] Hearings before the Senate subcommittee of the Committee on Government Operations, 85th Cong., 2d sess., on S. 3126, pt. I, May 2, 6, and 7, 1958; and pt. II, June 25–26, 1958.

Mr. HECHLER. I would be very pleased to hear Dr. Adkinson on that subject.

Dr. ADKINSON. The Air Force started a program of abstracting certain scientific journals from Russia, rather a large program, to do it rapidly and to get these abstracts available not only to the military and intelligence community and the Government in general, but it made them available to the public through the Office of Technical Services.

When they started this program, other agencies had been translating Russian abstracts in the same field. They stopped translating the Russian abstracts and started using the Air Force abstracts, so that you got a saving right there. In other words, here was cooperation.

We also, in Dr. Waterman's statement, pointed out that the Office of Technical Services and ASTIA—the Armed Services Technical Information Agency—are working in cooperation on their cataloging, which is a very expensive part of this information business. They are trying to cooperate to use the same cataloging cards so they don't do it over again, which is quite a common thing in the library field.

They are also cooperating in the acquisition of documents so they don't have to duplicate that effort. These are examples.

I can't tell you that we saved "blank" number of dollars, but that is an illustration of how economy is effected and at the same time there is an improvement in the information business.

Mr. HECHLER. Of course, that is where economy serves its best objective. I believe this committee is deeply interested in helping the National Science Foundation establish a firmer hand and a firmer control in this field that will result not only in an improvement of scientific information services, but in economy as well. Those are the objectives we are seeking.

Mr. DADDARIO. Will the gentleman yield?

Mr. HECHLER. Yes.

Mr. ANFUSO. You may have the floor.

Mr. DADDARIO. On that particular point the greatest economy is putting into the hands of our research people information which provides them shortcuts and gives them information on experiments held in other places and saves them times and helps them to go on to other accomplishments and in some cases saves them time in getting to the point somebody else in another part of the world has reached.

Dr. ADKINSON. There is no purpose, in an information program, as important as helping the researcher get on rapidly; that is the main economy.

Mr. DADDARIO. The more information we put in the hands of our research people, the more we are accomplishing. This program may grow and cost three or four times more than it does now, but as that grows, the savings in other areas, it would seem to me, would grow way out of proportion to the cost of this program itself.

Dr. WATERMAN. That is quite true, Mr. Daddario, and from the standpoint of the individual scientist, studies indicate in the normal course of his activities he spends a considerable amount of time looking for information which he must have. From the standpoint of a research man, his work should be original, or a verification or trial to see whether something someone else has done is correct. That also is useful, but if he should come out with a paper that duplicates what

someone else has done, he is wasting his time and damaging his reputation in the bargain. So it is important that he knows his contribution is unique and plays an important part in research.

Normally, of course, he looks through the journals and consults with colleagues all over the world if he is good. But the difficulty is, he may need information about another field and then he is more hesitant. He has to know where to go and does not want to be swamped with too much information. He wants to be selective, and so he turns usually to abstracts to get a summary; he determines from the abstracts the particular papers he wants to look into carefully, and naturally he wants those available as fast as he can get them.

Mr. ANFUSO. May I caution you that we have another witness, Mr. Conrad, who comes from out of town. He will not be available in the immediate future, whereas I am sure that Dr. Waterman and the members of his staff will always be available.

Dr. WATERMAN. That is correct.

Mr. DADDARIO. I have one more question on Dr. Waterman's statement and that is what I am leading up to.

In your budget requirements, through your discussions here and in conferences I have had with you and Dr. Adkinson in the past, it seems to me what you are trying to do is gradually build up this program. You are not trying to take too big a bite in any one year. Enlargement of your operation in this year has been with this gradual emphasis in mind.

Dr. WATERMAN. That is correct.

Mr. DADDARIO. In this sense it would imperil your program for the future because it would keep you behind 1 additional year and if you don't do it this year you will be making the same request next year because your goal is not to translate just 45 documents, but sometime in the future even to enlarge that. But you want to do it one gradual step at a time?

Dr. WATERMAN. If the additional funds are not provided our progress will be stopped.

Mr. DADDARIO. And it stops an orderly and sensible and reasonable type of progress. I do not think your demands are great and I think your requests within the budget are very proper. To my mind cutting it out is a step in the wrong direction.

Mr. ANFUSO. Thank you very much, Dr. Waterman.

Mr. Conrad.

STATEMENT OF G. MILES CONRAD, PRESIDENT, NATIONAL FEDERATION OF SCIENCE ABSTRACTING AND INDEXING SERVICES, ACCOMPANIED BY RAYMOND A. JENSEN, EXECUTIVE SECRETARY, NATIONAL FEDERATION OF SCIENCE ABSTRACTING AND INDEXING SERVICES

Mr. CONRAD. Mr. Chairman, I have asked the newly appointed executive secretary of the National Federation of Science Abstracting and Indexing Services, Mr. Jensen, to be with me.

Mr. ANFUSO. Thank you. Would you please identify yourself for the record?

Mr. CONRAD. My name is G. Miles Conrad. I am the director of Biological Abstracts and the president of the National Federation of Science Abstracting and Indexing Services.

Mr. ANFUSO. Dr. Conrad, I wonder whether I may make a suggestion. I see that your statement is rather lengthy.

We do not like to interrupt you. We would like to have you finish your statement. Would you accept the suggestion that the entire statement go in the record, and you refer to as many parts of it as you like or speak extemporaneously on other matters so as to fully cover your testimony?

Mr. CONRAD. All right. I shall endeavor to do that, Mr. Chairman.

Mr. ANFUSO. All right. The entire statement will be considered marked in evidence.

(The prepared statement of Mr. Conrad is as follows:)

STATEMENT OF G. MILES CONRAD, PRESIDENT, NATIONAL FEDERATION OF SCIENCE ABSTRACTING AND INDEXING SERVICES, ACCOMPANIED BY MR. RAYMOND A. JENSEN, EXECUTIVE SECRETARY, NATIONAL FEDERATION OF SCIENCE ABSTRACTING AND INDEXING SERVICES

Mr. Chairman and members of the House of Representatives Committee on Science and Astronautics, I am grateful for this opportunity to express my views regarding the dissemination of scientific information, especially with reference to the availability of information developed in foreign countries to the American scientist.

My name is G. Miles Conrad. I am the director of Biological Abstracts and the president of the National Federation of Science Abstracting and Indexing Services.

Although I am representing in a sense all the member organizations of the National Federation of Science Abstracting and Indexing Services with regard to the collection, analysis, and distribution of foreign scientific information, I shall perforce draw very heavily upon the experience of Biological Abstracts and the broad field of biology for some of my examples. However, observations based upon the experience of one member service of the federation will usually pertain generally to almost all comprehensive abstracting and indexing services regardless of the field of science or technology they serve.

In reviewing the problems of providing American scientists with scientific information developed in foreign countries it is essential to examine both the size of the output of research information throughout the world and the languages in which this information is published. With regard to the language problem we are most fortunate in having access to an exceptionally interesting monograph published in 1957 by UNESCO, edited by J. E. Holmstrom, and entitled, "Scientific and Technical Translating and Other Aspects of the Language Problem." In this detailed analysis of the languages of science several chapters are devoted to a review of the principal languages used by scientists and an assessment of the shifts in usage of some of the languages in accordance with shifts in research emphasis in the various nations and areas of the world.

In table I, which follows on the next page, I have attempted to summarize graphically the languages in which the principal scientific and technical publications of the world are published.

A study of this table shows quickly that those of us who read English are most fortunate, indeed, for in all of the broad fields of science more material is published in that language than in any other. Further, a reading knowledge of French and German—traditional language tools of the trained scientist—gives most American scientists reasonably ready access to the large majority of the world's research journals, as follows:

[In percent]

	English, French, German	Russian	All other
Botany, zoology, microbiology	71	13	16
Medicine, pharmacy, etc	66	7	22
Agriculture, forestry, fisheries, etc	75	5	20
Mathematics, astronomy, physics	72	8	20
Chemistry and metallurgy	68	9	23
Geology, meteorology, paleontology	55	19	26
Engineering, building, transport, etc	82	2	16
Manufactures: leather, rubber, etc	88	2	10

TABLE 1.—*Percentage of scientific and technical journals published in the world's major languages*

[Modified from J. E. Holmstrom, "Scientific and Technical Translating and Other Aspects of the Language Problems." UNESCO, Paris, 1957]

	English	French	German	Russian (and others using Cyrillic alphabet)	Spanish	Italian	Japanese	Portuguese	All others
Botany, zoology, microbiology	43	10	18	13	6	1	1.0	-----	8
Medicine, pharmacy, etc	40	11	15	7	8	7	2.0	2.0	8
Agriculture, forestry, fisheries, etc	49	12	14	5	5	4	.5	.5	10
Mathematics, astronomy, physics, etc	40	15	17	8	2	2	2.0	-----	14
Chemistry and metallurgy	42	11	15	9	4	6	2.0	-----	11
Geology, meteorology, paleontology	26	15	14	19	7	-----	4.0	3.0	12
Engineering, building, transport, etc	53	13	16	2	3	5	1.0	1.0	6
Manufactures: Leather, plastics, rubber, etc	52	21	15	2	2	-----	-----	-----	8

To further minimize the problem of the communication of foreign scientific information, many of those publications issued in the less widely read languages are available to American scientists through the simultaneous publication with the original article of summaries in English, German, or French. Thus, of the approximately 150 journals of biological interest published in Japan, about 80 percent are available, in part at least, to readers of English; 15 percent to readers of German; and 4 percent to readers of French. Similarly, of the 60-odd journals of biological interest published in Sweden, parts of 80 percent are available in English; 56 percent in German; and 37 percent in French. The same situation tends to prevail among the journals published in the less common languages of science, such as Dutch, Danish, Icelandic, Finnish, Turkish, Hebrew, Chinese, Arabic, etc. Knowlege of Spanish and Italian, while not normally a part of the equipment of the average American scientist, is widespread enough in the United States so that access to scientific information in those languages presents little difficulty.

It appears, then, that the major linguistic problem for American science lies in the area of the Slavic tongues and those of the Orient. We have seen that the growing scientific literature of Japan is currently readily available to American scientists through the widespread use of English by the Japanese. The scientific literature of southeast Asia and the Malay region is negligible; that of India and Pakistan is in English; but what of China? Correspondence by several members of the Federation with the Institute of Scientific Information of the Academia Sinica in Peiping tells us that, of the 74 journals that are apparently being currently published in China, three are published in English; 35 are published in Chinese, but with abstracts in Western languages; and 36 are published in Chinese alone.

The foregoing brief review tends to show, I believe, that American scientists have rather easy access to the vast majority of scientific research writings through a knowledge of English, German, and French—even when, occasionally, their needs send them into literature published in the more obscure languages. At present the major exception is, of course, Russian and its related tongues. (Even here, however, there has been a recent tendency to provide summaries in Western languages.) Scientific developments in Russia have always been reported by the abstracting and indexing services of science—the current problem results not from the fact that this information is written in an unfamiliar alphabet and a strange language, but rather because of the burgeoning amount of Russian scientific publication that has burst upon the world in recent years.

The social and economic climate for the development of science and research has continued most favorable throughout the 19th century and the first half of the 20th in Western Europe and the United States. This fact undoubtedly accounts for the ready accessibility to most information by those who read English, French, and German.

From appearances, the climate for research and the development of science was not as favorable in Russia during this same period. However, it is increasingly evident that through the raising of the general level of education and the need to pursue scientific and technologic research for its material values, Russia

is just now entering upon a new upsurge of research activity with its attendant increase in publication. This tardy entrance into the widespread and enthusiastic pursuit of science becomes immediately evident from a study of the growth in the number of scientific and technical publications published in the United States and in Russia since 1800. Thus:

Percentage of the present total of journals published

Year	In the United States	In the U.S.S.R.	Year	In the United States	In the U.S.S.R.
1800	0.06	.0	1890	6	1.2
1810	.06	.0	1900	10	1.4
1820	.08	.0	1910	16	2.2
1830	.17	.09	1920	44	3.9
1840	.25	.2	1930	57	14.5
1850	.47	.2	1940	70	40.0
1860	.64	.2	1950	95	95.0
1870	1.4	.7	1952	100	100.0
1880	3.0	.8			

Lest at first glance the foregoing table be not too clear, an example will serve to illustrate its meaning. Thus, in 1920, 44 percent of the scientific and technical journals now published in the United States were in existence, but it was not until more than 20 years later (in 1943, actually) that Russia reached this relative point in the development of its scientific periodicals. In absolute numbers of publications, of course, the United States has a substantial lead over Russia, as a study of appendix 1 will show. However, the rate at which scientific publication in the two countries is growing suggests that Russia may soon draw abreast of and may even surpass the United States. Aside from the various alarming thoughts that such a possibility evokes such a situation would pose for American scientists an ever-increasing problem in communication.

There are at present being published in Russia probably from 1,800 to 2,000 scientific and technical periodicals. To provide access to this literature, some have advocated the so-called cover-to-cover translation of journals. Through this program, to a large extent financed by the Federal Government, American scientists have direct access to 68 translated journals, or only about 3½ percent. Obviously, this can be little more than a stopgap solution to the present and future problem. The only practical and realistic solution lies in the training of young scientists in the Russian language—not, however, at the expense of French and German, for the latter are still very significant languages for science.

Although the total number of Russian publications is large, it represents only 4 or 5 percent of the possible total of 50,000 periodicals published throughout the world. Are we not unduly concerned with Russian scientific information? Have not national and linguistic origins of scientific information always been a problem? How has the world's scientific information been disseminated in the past?

These, and similar questions, are probably best answered by a review of the process of what has come to be called the documentation of science.

Mr. CONRAD. The conveying of scientific information from producer to user follows several well-defined steps that have been developed over the years and have come to be accepted by all of the world's scientists. A scientist, having completed a particular body of research, submits a report for publication to what is called a primary journal. His report and the journal to which he submits it are usually in his mother tongue. If this tongue is one of the widely used western languages that is all the reporting scientist will use. If, however, the report is written in a less well-known language the scientist-author, or his editor, will often provide in addition a summary of the research in some language that his foreign colleagues are more likely to understand.

If the primary journal were then widely circulated, there would be some chance that the report would reach the eyes of interested but unknown colleagues throughout the world who would understand and make use of the information.

Almost invariably, however, the primary journals in which research reports are published are very limited in their circulation—500 copies or less is not unusual—and this small circulation is often limited to the nation of origin; although a few copies of most do find their way into the collections of the few truly great libraries of the world.

In general, though, only the author's own local colleagues would ever learn of the existence of his research report if it were not for the abstracting and indexing services.

It was in order to minimize this possible loss of scientific knowledge by insuring the international dissemination of scientific information that abstracting and indexing services came into being.

As early as 1807 in the field of geology and mineralogy this need was felt and the first abstracting service was established in Germany.

Throughout the intervening 150 years many additional abstracting and indexing journals (secondary publications) have been established to serve the ever-increasing number of interests in science. Sometimes these services have been established by great libraries where a majority of the world's periodicals in a field of science are received—for example, the Bibliography of Agriculture, published by the United States Department of Agriculture Library and the Current List of Medical Literature, published by our National Library of Medicine.

Some abstracting and indexing services are sponsored by scientific societies, such as Chemical Abstracts, published by the American Chemical Society; Meteorological Abstracts, published by the American Meteorological Society; or the Zoological Record, published by the Zoological Society of London.

My own service, Biological Abstracts, is one of the very few that is completely independent of either a library or a scientific society. It was established as an independent, nonprofit, cooperative venture of the world's biologists and incorporated through the joint efforts of the National Academy of Sciences, the American Association for the Advancement of Science, and the Union of American Biological Societies.

I tell you this in order to show that the very existence of the abstracting and indexing services reflects the importance that organized science attaches to the need for the international communication of scientific information.

Let us return to the scientist-author whose research has been published in the limited-circulation primary journal. His article will now be abstracted, indexed, and distributed in abstract form throughout the world by the appropriate abstracting and indexing service, or services.

For example, if Dr. Lupescu of Bucharest writes and publishes a biological article in Rumanian, an English abstract will eventually appear in Biological Abstracts for the American scientist to see. However, knowledge of Dr. Lupescu's research will not be limited to American readers, but will accompany Biological Abstracts into 97 countries or principal dependencies of the world. As a result, Dr. Lupescu may one day be flattered, but not unduly surprised, to receive a letter regarding his research from Dr. Moto in Tokyo, Dr. Jones in Kenya, or Sr. Blanca in El Salvador.

How does the abstracting service make sure that Dr. Lupescu's article was "covered"? Although the method of abstract or title

collection may differ in detail from service to service, I shall describe the situation at Biological Abstracts.

First, Biological Abstracts publishes from time to time a list of the primary journals it is covering. As long as a primary journal remains on this list we have an abstracter assigned to it who undertakes to provide us with abstracts of all biological articles published in that journal.

In order to publish 62,500 abstracts per year Biological Abstracts currently monitors more than 3,700 periodicals originating in 83 countries and in 34 languages.

Among these will have been the journal in which Dr. Lupescu's article was published.

Although the major share of the abstracting of foreign language articles is done voluntarily by American biologists, we are very materially assisted by an additional 175 foreign biologists who serve as volunteer abstracters and who are located in 37 different countries, including Russia and mainland China.

Having thus collected abstracts from the world's literature of biology our own editors arrange, classify and index the information for secondary publication. The next, and final step is up to the individual scientist—be he American or foreign. It is now the responsibility of the individual to search the contents of the abstracting and indexing journal for the information he requires; if he does not find it, it very likely does not exist.

Those of us who are responsible for making scientific information available can so improve and modify our services that the individual scientist's search for information is made easier, but we cannot eliminate the search—we cannot spoon feed him. Indeed, it would be undesirable for us to do so even if it were possible. The search is his professional responsibility—and the new ideas that will occur to him during the search are his stimulation.

But this merely describes briefly for you the process of disseminating scientific information; it does not indicate how well we are covering the Russian and Chinese literatures of science. Our abstract coverage of the Russian literature is as good as Russia's abstract coverage of its own openly published research, for it is essentially identical.

Since the day of the sputnik, we have heard much of the Soviet All-Union Institute of Scientific and Technical Information and the 13 abstracting journals it publishes—more of this later.

Abstracts of articles originating in the Soviet bloc countries that are published in this series of abstracting journals are translated into English by the United States Joint Publications Research Service for distribution by the Office of Technical Services. Through the cooperation of these two Federal agencies, the abstracting and indexing services of the United States are permitted to reprint these translated abstracts for direct dissemination to workers in their respective areas of science and technology. This comprehensive series of Russian abstract journals claimed, in 1956, to cover a total of 4,648 periodicals. Of this number, 1,075 were Russian. In 1957 the number of Russian periodicals covered had increased to 1,804. Thus, if the average Russian scientist has access to an abstract of an article published in Russia, so potentially does our American scientist. For secretly reported information we cannot, of course, be responsible.

How good is our coverage of Chinese science? In appendix 1 are listed the numbers and fields of Chinese scientific and technical journals that were published at one time or another during the period, 1905–55.

Mortality statistics regarding the birth and death of these periodicals are scanty and, until last year, we had but a poor idea of the current number that are being published. As was noted above, however, we have now learned from the Institute of Scientific Information of the Chinese Academy that at least 74 are in existence, of which 51 percent will be linguistically available to us in some Western European tongues.

Here, if it is not already in the record, in Dr. Adkinson's testimony, is an interesting report from the New York Times of last Sunday, which gives the current number of Chinese periodicals as being 450, of which 200 are available in this country—in this city, I believe.

Mr. ANFUSO. Do you want to make the article a part of the record?

Mr. CONRAD. I do not know whether it would be appropriate for me to suggest it, but I think it would be well to have it somewhere in the record.

Mr. ANFUSO. Without objection it will be inserted as part of the testimony.

(The article referred to is as follows:)

[From New York Times, May 31, 1959]

U.S. PLANS TO SIFT PEIPING'S SCIENCE—BUT HOUSE FUND CUT IMPERILS PROGRAM OF TRANSLATING CHINESE PERIODICALS

(By John W. Finney)

WASHINGTON, May 30, 1959.—The Government for the first time is moving to keep scientists informed on scientific developments in Communist China through translation of Chinese scientific publications.

The National Science Foundation, as the Government's central agency for dissemination of international scientific information, is planning in the coming year to start translating scientific publications from Communist China.

The Foundation's plans have a significance far beyond the objective of dissemination of scientific information for they constitute one of the first official recognitions of the potential scientific challenge presented by the Peiping regime.

WOULD AVOID SURPRISE

By embarking now on a program of translating Chinese scientific literature, Foundation officials frankly hope that the United States will not be caught by surprise by scientific developments on the Chinese mainland, as occurred in the case of Soviet Union.

The Foundation's preliminary program for translation of Chinese scientific research results has become imperiled in recent week by economy cuts made by the House in the Foundation's budget for the coming fiscal year.

Unless the House cut is restored in the Senate, the Foundation will have to abandon its initial attempts at translation of Chinese Communist publications. It also will have to scale down a planned expansion in the translation of Russian publications.

TRANSLATION FROM RUSSIAN

One impact of the Soviet sputniks has been a marked increase in translation of Soviet scientific literature, with the Government now sponsoring translation of 70 publications, half of them by the Foundation.

The Foundation had been planning to increase its share to 45 in the coming year as part of an overall Government program to raise the number to 100. Under the House cut, the Foundation will have to abandon plans to translate five of the additional Soviet scientific journals.

With Communist China, the Foundation had been planning to start off on a small scale with translation of two or three journals as a pilot project pointing toward a rapid expansion in 1961.

The modest program was explained by Foundation officials as resulting from difficulties posed by translation from the Chinese. One of the most critical problems is the lack of competent translators, and to meet this problem the Foundation is exploring the possibility of having the journals translated in some foreign countries, such as Nationalist China, Japan, or India.

According to a survey by the Foundation, there are about 450 scientific periodicals being published in Communist China. The Foundation does not plan to translate all of these, but it does hope that ultimately a good proportion of the "significant" Chinese scientific literature will be made available.

Over 200 Communist Chinese scientific periodicals are now being received by Government libraries in the Capital, such as the Library of Congress.

MOST UNTRANSLATED

Most of these publications, according to Dr. Burton W. Adkinson, head of the Foundation's Office of Scientific Information, are lying on the shelfs untranslated—a condition reminiscent of the inattention provided Soviet scientific literature preceding the appearance of the first Soviet earth satellite.

In emphasizing the necessity for proceeding now with a Chinese translation program, Dr. Adkinson noted in an interview that while the situation was not critical now, "in a few years Communist China may suddenly appear on the scene as one of the powers in the scientific and technical world."

"If we don't start translating their literature today," he said, "we are likely to be in the same position we were in 5 years ago with the Soviet Union, where we had a mass of untranslated material and were caught by surprise by Soviet scientific and technological advances."

As appraised by Government no logical progress in Communist China is hampered by lack of trained personnel. It is believed, however, that this is only a temporary handicap, since the Peiping Government is known to be training thousands of scientists, engineers, and technicians.

An indication of the expanding effort in Communist China cited by officials is the report that the Chinese Academy of Sciences now has 68 research institutes—more than double the number existing in 1952.

Mr. CONRAD. Over the past decade Biological Abstracts has from time to time obtained abstracts from 21 Chinese journals of biology, but it must be admitted that our coverage of the recent Chinese literature has been haphazard.

Since the beginning of this year we have been taking steps to improve in this department and are hopeful that our correspondence with Peking will soon bring about a more direct flow of periodicals and abstracts. Actually, in the case of biology, this will mean the covering of only about 40 periodicals.

Mr. ANFUSO. May I inquire from you whether or not you had any difficulty in dealing with the Chinese in this respect?

Mr. CONRAD. No, sir, not really, except the tardiness of the mails, perhaps. We wrote a letter to them in January and they replied to this early in March. We did not hear from them and then we wrote another letter and I guess our second letter crossed their reply to our first. We have not actually received any materials from them other than this correspondence, but it is interesting and the letter itself is in a most cordial tone, and the committee members might be interested in looking at it.

INSTITUTE OF SCIENTIFIC INFORMATION, ACADEMIA SINICA,
Peking, China, March 14, 1959.

Mr. ALLEN J. SPROW,
Biological Abstracts, University of Pennsylvania,
Philadelphia, Pa.

DEAR MR. SPROW: We are very pleased to read your letter of January 22, 1959, informing us that your institution intends to publish 62,500 abstracts in biology and related fields this year.

We wish to inform you that this institute has now started publishing the Science Abstracts of China in five sections. The section on biological sciences contains abstracts of articles selected from a greater number of Chinese journals than those listed in your letter. As such, we feel that this section of SAC may be the right publication you need. Under separate cover, we are forwarding you a specimen copy each of Nos. 1 and 2, 1958, together with three preliminary mimeographed copies of SAC. We shall be glad to add your name to our regular mailing list if you are interested in getting it.

In return, we would appreciate receiving your Biological Abstracts in exchange for our biological section of SAC. We realize that in so doing you will have the poorer part of the bargain judging from the amount of abstracts published on both sides. We are sure that with the passage of time, SAC will grow in quantity and quality. At the present moment our lack of experience in abstracting is a handicap. Therefore your comments and criticisms are welcome.

We hope that you will give our suggestion due consideration and favor us with an early reply.

Yours faithfully,

INSTITUTE OF SCIENTIFIC INFORMATION OF CHINA,
T. C. LIU,
Head, Department of Documentation Service.

Also we have a photocopy sample of "Science Abstracts of China," the biological section. We have now asked that we set up an exchange between ourselves and the Chinese Academy for this particular section. I am quite sure they will agree to this shortly.

Mr. ANFUSO. Do we have any Chinese scientists at our disposal?

Mr. CONRAD. In this country?

Mr. ANFUSO. Yes.

Mr. CONRAD. Oh, many.

Mr. ANFUSO. I suppose there are many Japanese too?

Mr. CONRAD. Yes. We have a Japanese on our staff who, while born in this country is not a Nisei, spent a good many years in Japan and is a medical and biological research worker. She speaks Japanese and reads it. We do not have anybody from China on our staff.

At this point it seems desirable to clarify this business of translating. We hear so much about it.

It is the experience of Biological Abstracts—and I believe that of most abstracting and indexing services—that it is best to read and understand a foreign-language article and then write an abstract of it in English. That is what our foreign abstracters do. They do not write abstracts in a foreign language for us to translate.

In our opinion this is a very great deficiency in our present wide coverage of Russian research—we feel strongly that proper abstract coverage can only be provided when American scientist-abstracters who understand Russian can read the "primary" article and then prepare an English-language abstract directly.

To accomplish this desired end we are handicapped by the limited number of American scientists who can read Russian and thus serve as abstracters.

As we heard earlier, only 2 percent of American scientists can read Russian. It is far easier to obtain a large proportion of the Russian primary journals than it is to obtain abstracters in this country. I can suggest no ready solution to this problem, other than to increase the instruction in the Russian language at the university level.

If you will note from some of the data in the charts, there are probably 2,000 Russian periodicals being published in science and technology and of this number only 68 are being translated from cover to cover. It would be an extremely costly and even foolish attempt to

translate all of these 2,000. Therefore, it seems to me more sensible to provide first an English abstract so that American scientists can judge the desirability of further detailed translation of the complete article.

It should be pointed out and emphasized that not all reports of research are of equal importance or significance. Some may be relatively trivial reports giving more detail about something already well known, whereas others will be reports of new discoveries or novel methods. Therefore, I would not increase substantially the present "cover-to-cover" system of translation, but would expand the selective translation of complete articles of significant interest as determined by review of abstracts by American scientists. For some years now, translations of specific articles have been registered and announced in a series of various sponsored bulletins. These several bulletins have now in effect been consolidated in Technical Translations, a new publication of the Office of Technical Services. This is a service that should be strengthened and enlarged.

In connection with a program of selective translation it becomes important to insure easy access to any complete article to which the scientist has been introduced by an abstract. Having learned of an interesting article, the scientist must discover a library that receives the journal in which it appeared. If it is convenient he will go to that library; or, better, attempt to borrow the journal; or, better still, he will ask that a photocopy be made for his own use. For many years a photocopying service of this sort was provided many American scientists by the Department of Agriculture Library, but several years ago this was discontinued.

The National Library of Medicine, I believe, provides such a service to other libraries who may request such copies for the use of their readers. Many private libraries offer photocopy facilities, but to provide truly comprehensive service the library must be a large, well-financed one whose collections can match the coverage of the abstracting and indexing services. There are very few that can provide such a service.

Biological Abstracts has an arrangement with one of these, the John Crerar Library of Chicago. This library undertakes to provide for a very modest fee a copy of the complete text of virtually any journal article abstracted by BA. This is a link of great importance in the chain of scientific communication and it is one to which the National Science Foundation has given modest assistance through its support of the Midwest Interlibrary Center in the fields of biology and chemistry.

The need exists, I believe, for similar regional centers elsewhere in the United States where essentially complete science journal collections can be housed and serviced. This is an important area for cultivation by the Foundation.

Before concluding my remarks, I would like to present two tables, 2 and 3, which are of considerable significance for they compare the major informational resources of the American and the Russian scientist.

TABLE 2.—*Abstract and citation coverage provided by members of the National Federation of Science Abstracting and Indexing Services*

	1957	1958	Percent increase	1959	Percent increase over 1957
Abstract services:					
Aero/Space Reviews	6,770	8,500	25	12,000	77
Applied Mechanics Reviews	4,245	5,285	24	6,000	41
Biological Abstracts	40,061	42,575	6	62,500	56
Chemical Abstracts	101,027	117,656	16	130,000	29
Engineering Index	26,300	30,000	14	45,000	71
Mathematical Reviews	9,200	9,000	(−2)	9,000	(−2)
Meteorological Abstracts	5,000	5,000	0	7,500	50
Nuclear Science Abstracts	14,042	18,000	28	25,000	78
Psychological Abstracts	9,074	6,100	(−33)	12,000	32
Review of Metal Literature	8,219	12,000	46	12,000	46
Technical Abstracts Bulletin (ASTIA)	4,276	30,000	601	32,000	648
U.S. Government Research Reports (OTS)	8,400	9,625	14	10,000	19
Technical Translations (OTS)				10,000	
Subtotal	236,614	293,741	24	373,000	58
Title listing services:					
Bibliography of Agriculture	96,258	99,470	3	100,000	4
Current List of Medical Literature	104,517	114,214	9	115,000	10
Subtotal	200,775	213,684	6	215,000	7
Grand total	437,389	507,425	16	588,000	34

TABLE 3.—*Abstract and citation coverage provided by the Soviet All-Union Institute of Scientific and Technical Information*

	1957	1958	Percent increase or (decrease)
1. Astronomy & Geodesy	10,000	7,902	(−21)
2. Biology	103,445	[1] 113,375	9
3. Biochemistry	27,023	33,207	23
4. Chemistry	79,039	84,041	6
5. Electrical Engineering	[1] [2] 45,206	[1] [3] 45,206	[4]
6. Geography	27,601	30,197	9
7. Geology	18,394	22,203	21
8. Geophysics	10,750	9,650	(−10)
9. Mechanical Engineering	53,450	[1] [3] 53,450	[4]
10. Mathematics	9,035	[1] 10,925	21
11. Mechanics	13,649	15,105	11
12. Metallurgy	25,562	25,579	(5)
13. Physics	31,850	28,970	(−9)
Total	455,004	479,810	5

[1] Estimate.
[2] Final issues of 1957 will be published in 1959.
[3] The 1957 figures are used as estimates because so few 1958 issues have been received by libraries in the United States.
[4] No change.

Although there are additional bibliographic services in both countries—and still more that are available in other English-speaking nations—those listed in tables 2 and 3 are the largest and most comprehensive on both sides of the "linguistic curtain."

We are most proud of the growth in coverage provided by the members of the National Federation of Science Abstracting and Indexing Services.

In 1959 we shall have increased our abstract coverage by 58 percent over that of 1957, and our total coverage by 34 percent. In our competitive race with the All-Union Institute we have now pulled ahead and our coverage in 1958 was 6 percent greater than that of Russia. Although it is too early to be sure, it looks as though we shall extend our lead in 1959.

American scientists can be sure that the abstracting and indexing services of the United States are providing them with as good and

usually better coverage of the world's literature than is provided Russia's scientists by the All-Union Institute.

Thank you, gentlemen, for this opportunity to express my views on the international flow of scientific information and the adequacy of our abstracting and indexing services in providing American scientists with information developed in foreign countries. I hope that some of the information I have been able to offer will be of assistance to the committee in its work. Mr. Chairman, I have some additional tabuations which I will not read now but I will submit for the record.

(The tabulation follows:)

APPENDIX 1

Number of periodicals and fields of science and technology covered by publications of Soviet Union (1945–53), China (1905–55), and United States (1950–53) [1]

Field of science	Soviet Union	China	United States
General science	139	104	163
General science publications	17	51	58
Publications of academies	48	53	27
Publications of universities	45	----------	10
Regional studies	12	----------	4
Science education	17	----------	15
Scientific and technical history	----------	----------	11
Instruments and laboratories	----------	----------	38
Physical sciences	164	18	286
Mathematics	33	4	39
Astronomy	42	3	21
Physics:			
General	46	4	30
Atomic and nuclear	?	----------	104
Chemistry:			
General	24	7	56
Analytical	3	----------	15
Organic	4	----------	12
Physical	12	----------	9
Earth sciences	158	77	295
General	17	19	27
Economic geology	27	4	46
Geodesy	9	----------	----------
Geography and physiography	25	18	11
Geophysics	42	17	104
Historical geology	3	----------	----------
Mineralogy	4	1	9
Oceanography	5	3	11
Paleontology	9	1	9
Petrology	3	----------	----------
Regional geology	14	14	78
Life sciences	200	63	496
Biology:			
General	25	13	66
Anatomy	3	----------	9
Biochemistry and biophysics	13	----------	40
Ecology	----------	----------	4
Genetics	3	----------	6
Marine biology	7	1	15
Microbiology	19	1	21
Morphology	1	1	----------
Natural history	17	2	45
Parasitology	11	----------	3
Physiology	16	4	15
Botany	50	7	49
Zoology:			
General	17	4	59
Entomology	1	10	47
Science of man:			
Anthropology	7	1	39
Archeology	10	19	17
Eugenics	----------	----------	2
Psychology	----------	----------	42
Human engineering	----------	----------	17

See footnotes at end of table, p. 109.

Number of periodicals and fields of science and technology covered by publications of Soviet Union (1945–53), China (1905–55), and United States (1950–53) [1]— Continued

Field of science	Soviet Union	China	United States
Agriculture	337	131	954
General	76	85	287
Agricultural technology:			
General	7		
Agricultural chemistry	8	2	26
Agricultural engineering and machinery	20		22
Plant disease and pest control	7	1	44
Seeds	12	1	14
Soils and fertilizers	21	2	59
Crops and gardens:			
Field crops	27	17	58
Horticulture	27	1	112
Landscaping			11
Forestry	32	10	69
Animal culture:			
General	23	1	3
Apiculture	2		10
Dairying	7		21
Farm and range animals	21		47
Feeds and feeding	4		30
Fish culture	13	10	58
Fur-bearing animals	4		8
Horse breeding			4
Veterinary science	26	1	23
Wildlife			48
Medicine	303	75	1,016
General	81	47	199
Medical technology:			
General			4
Anesthesiology			4
Antibiotics	1		
Medical chemistry			11
Medical facilities and care	15		41
Medical laboratories and techniques			10
Pathology	6		9
Pharmacy and pharmacology	9	4	91
Radiology	8		47
Therapeutics	14		31
Medical specialties:			
Aviation medicine			14
Cardiology	1		11
Chiropody			4
Dermatology	11		5
Environmental medicine			8
Endocrinology	1		10
Gastroenterology			7
Geriatrics			4
Hematology	3		3
Military medicine			2
Neurology	18		18
Obstetrics, gynecology	7	1	12
Ophthalmology	8		30
Otorhinolaryngology	7		19
Pediatrics	7	1	24
Proctology			2
Toxicology	3		2
Urology			13
Diseases and their treatment:			
General	2		25
Cancer	10		14
Diabetes			4
Malaria	2		
Tuberculosis	5		10
Venereal diseases	11		6
Psychiatry and mental health	15		58
Surgery	15		50
Dentistry		2	107
Public and preventive medicine:			
Forensic medicine			5
Health and hygiene	7	13	7
Industrial medicine	3		14
Preventive measures	24	3	29
Public health	9	4	52

See footnotes at end of table, p. 109.

Number of periodicals and fields of science and technology covered by publications of Soviet Union (1945–53), China (1905–55), and United States (1950–53) [1]— Continued

Field of science	Soviet Union	China	United States
Engineering and technology	708	179	1,319
General:			
General engineering	4	39	95
General technology	21		34
Industrial management and production	10	20	30
Materials	1		7
Patents and inventions	9		13
Standardization	10	2	
Technical literature indexes	8		21
Civil engineering:			
General		7	21
Highway engineering	8	3	44
Hydraulic engineering	21	4	84
Municipal engineering	8	1	6
Water conservation		20	
Mechanical engineering:			
General	9	1	10
Machinery	40	2	22
Power engineering	29	1	13
Refrigeration	1		6
Electrical engineering and communications:			
General	11	1	43
Communications	19	13	46
Electric power	35	5	8
Electronics	2		23
Building and construction:			
General	53		21
Architectural design	39	2	18
Construction materials	16		26
Fire prevention			6
Heating and air conditioning			19
Transportation and automotive engineering:			
General	9	2	
Aeronautics and aviation industry	26	6	89
Rockets and astronautics	2		10
Automobiles, trucks, and tractors	15	2	30
Marine engineering	22	1	28
Railroad engineering	28	3	20
Military engineering	21	1	45
Mining and metallurgy:			
Metallurgy	36	9	84
Mining engineering	34	11	29
Nonmetallic minerals	8	1	12
Chemical technology:			
General	19	3	24
Chemical engineering		5	5
Fuel technology		1	
Coal			11
Gas			16
Petroleum	34		39
Inorganic chemicals			6
Organic chemicals	4		37
Food technology:			
General	11		19
Beverages	4		14
Preparation and consumption			28
Processing and preserving	20		20
Photography	13		32
Light industries:			
General	8	1	
Clock, watchmaking			5
Glass and bottling			8
Leather			6
Lumber	12		46
Paper	3	1	15
Printing	7		7
Rubber	5		4
Textiles	13	11	21

See footnotes at end of table, p. 109.

Number of periodicals and fields of science and technology covered by publications of Soviet Union (1945–53), China (1905–55), and United States (1950–53) [1]—Con.

RECAPITULATION

Field of science	Soviet Union	China	United States
General science	139	104	163
Physical sciences	164	18	286
Earth sciences	158	77	295
Life sciences	200	63	496
Agriculture	337	131	954
Medicine	303	75	1,016
Engineering and technology	708	179	1,319
Totals [1]	2,009	647	4,529

[1] Because of multiple entries these totals are greater than the actual number of journals published in each country.

Data compiled from the following references:

1. Scientific and Technical Serial Publications: Soviet Union, 1945–53. Science Division, Library of Congress, Washington, 1954.
2. Chinese Scientific and Technical Publications in the Collections of the Library of Congress. Science Division, Library of Congress, Washington, 1955.
3. Scientific and Technical Serial Publications: United States, 1950–53. Science Division, Library of Congress, Washington, 1954.

Mr. ANFUSO. Thank you. I am very much encouraged by that last part of your statement where you say that American scientists can be sure that the abstracting and indexing services of the United States are providing them with as good and usually better coverage of the world literature than is provided Russia's scientists by the All-Union Institute.

Is the All-Union Institute the institute that gathers and disseminates the information?

Mr. CONRAD. In Russia?

Mr. ANFUSO. Yes.

Mr. CONRAD. Yes.

Mr. ANFUSO. Do we have a similar institute in this country, one coordinating body that does all this work?

Mr. CONRAD. No, sir, we don't, except that the Science Information Service of the National Science Foundation may serve as a clearinghouse to which each of us as independent organizations can turn for assistance and coordination of our activities.

In addition, we have created the National Federation of Science Abstracting and Indexing Services with both private and governmental abstracting and indexing services as members. Through this new National Federation we hope to improve our coordination without, at the same time, sacrificing the initiative which we believe is necessary in best serving the interests of each of the several fields of science.

Scientists in different fields of science have slightly different ways of seeking research information and it is felt that special, independently edited services coordinating their efforts with each other can best serve the specialists in each field of science.

Mr. ANFUSO. In these international conferences, has there ever been any talk of a world library of science?

Mr. CONRAD. I think there has been some discussion from time to time, in UNESCO circles, at least, of providing some central scientific information clearinghouse.

Mr. ANFUSO. In other words, there has been talk about it, but nothing has ever been done about it?

Mr. CONRAD. Not to my knowledge.

Mr. ANFUSO. Do you think it would be advantageous, for example, to have a library properly staffed with foreign writers and foreign translators, like we have here in the Library of Congress, to handle all scientific data from all over the world, all housed in one building?

Mr. CONRAD. It would be a most difficult thing to accomplish, certainly.

Mr. Anfuso. What are the difficulties?

Mr. CONRAD. Well, there are many vested and national interests involved here, I believe, that would make it rather difficult to bring this about in the immediate future, or in the very—well, even in the foreseeable future.

Mr. ANFUSO. Suppose it were done under the auspices of the United Nations. It would certainly ease the burden of each individual country to try to translate all this scientific information which is thrust out onto the world.

Mr. CONRAD. It would certainly be most advantageous to the majority of the countries of the world, I would imagine, because many scientists in many parts of the world are greatly handicapped.

They were born and brought up in cultures rather narrow, linguistically, and their national literatures do not provide them with a sufficient amount of scientific information to work independently. We in the United States and England are in a happier position because so much is written in English.

Actually, a person in this country can conduct a great deal of research without ever searching the foreign language literature.

Mr. ANFUSO. Are there any questions?

Mr. MOELLER. May I ask the witness a question?

Mr. ANFUSO. Certainly.

Mr. MOELLER. I think you have presented a very learned and useful analysis.

In translations you mentioned in going from the primary to the abstract, oftentimes the primary was merely read, digested, and then reproduced in English. Do you find oftentimes the force of the study is lost in the inaccuracy, possibly, of translation?

Mr. CONRAD. I think it is fair to say, yes, that this sometimes happens.

Mr. MOELLER. As a result of that, possibly, a direct translation is not possibly a wise thing?

Mr. CONRAD. A direct translation may also introduce error or lose force. It depends upon the translator. I think most abstracts are not intended, of course, to substitute for the original, but to alert the reader to the fact that information exists which he may or may not want to pursue further.

Mr. MOELLER. Could certain fallacies put him on the wrong track?

Mr. CONRAD. It might, on occasion, of course.

Mr. ANFUSO. Are there any other questions?

Mr. HALL. Yes, Mr. Chairman.

Mr. ANFUSO. Mr. Hall.

Mr. HALL. How is your work financed? How is the National Federation of Science Abstracting and Indexing Services financed?

Mr. CONRAD. Well, sir, this is a relatively new organization. It was incorporated about a year ago. It has 14 major services as members, and roughly half of them are private, in the sense that they are nonprofit organizations, sponsored by scientific societies. They have provided one-half of the first year's funds to the sum of about $14,000. The National Science Foundation has matched this amount for our first year's operation. This grant from the Foundation we have considered as the first year's contribution from the Government abstracting and indexing services that are members.

Future years will be financed by dues from the member organizations.

Mr. HALL. You make the statement here, and it was repeated by the chairman a moment ago, that American scientists can be sure that the indexing services of the United States are providing them with as good and usually better coverage of the world literature than is provided Russia's scientists by the All-Union Institute.

Do you mean that with respect to a particular piece of information that is available, or to the total volume of information that is available to both this country and to Russia?

Mr. CONRAD. To the total volume.

Mr. HALL. We had testimony here some time ago, when we first started hearings, that one of the crying needs of the American scientist was translation of more material published by Russia, for one, and by many countries of the world. We understood that 20 or 30 times or even 100 times the amount of material that was available to us was being either translated for or being understood by Russian scientists.

Do we have the same availability of material in this country that the Russian scientists have in their country?

Mr. CONRAD. I would say so, yes.

Mr. HALL. You would say so?

Mr. CONRAD. Yes.

Mr. ANFUSO. Are there any other questions?

If not, thank you very much, Dr. Conrad, for a very fine statement and a fine presentation.

This meeting stands recessed.

(Whereupon, at 11:50 a.m., the committee recessed.)

DISSEMINATION OF SCIENTIFIC INFORMATION

HOUSE OF REPRESENTATIVES,
COMMITTEE ON SCIENCE AND ASTRONAUTICS,
Washington, D.C., Wednesday, June 17, 1959.

The committee met, pursuant to call, at 10 a.m., Hon. Overton Brooks (chairman of the committee) presiding.

The CHAIRMAN. The committee will please come to order. This morning, I wish to say to the members of the committee, I think it is proper to take up the consideration of this report on the nuclear explosions in space, which was available yesterday, but on the request of one of the members, consideration was postponed. It is the policy of the committee to get these out to the members in advance, and if there is no objection, then to consider them and dispose of them, in the full committee. Mr. Hechler yesterday wanted more time. Have you had time to peruse the report?

Mr. HECHLER. I have had time to read the report. I think it is a good report, and I would move its adoption.

The CHAIRMAN. It is an excellent report. It is a short one. You have heard the motion. If there is no objection to the report, it stands adopted. There appear to be none and it is so ordered.

There are two or three matters we should take up this morning. We have two important witnesses, but these matters will take only a moment or two.

Mr. Hechler, we will take up the report of your subcommittee. Do you wish to make your report on the Seals Subcommittee at this time?

Mr. HECHLER. The subcommittee held several meetings and polls on an official design for the seal of the committee. In the first meeting we decided we would emphasize the nonmilitary aspect of the committee's work in designing the seal and we have several suggestions which members of the committee have considered. We think we have reached the point now where it would be valuable for the members of the full committee to view some of these alternatives. I would suggest that possibly during our open house in the committee room tomorrow afternoon we put these seals on display for comment of the members of the committee and others.

The CHAIRMAN. Do you have copies of the seals available?

Mr. HECHLER. I do.

The CHAIRMAN. If there is no objection, then—of course, you are chairman of the subcommittee—will you make available on the walls here of the office or in conspicuous places copies of the suggestions, so that all of the members and others may see and make comments upon them, and I know everybody would be glad to see them. That brings up the question of the open house tomorrow afternoon.

I don't know what the program will be—whether we will finish the mutual security bill this afternoon or not. We will know a little later on. But, regardless of that, we have open house from 2:30 to 5:30. I know that all of the members of the committee cannot be here the entire time, but be here as much as you can, because we are host to the Congress. We have personally invited the chairman of each committee and the ranking Republican on each committee, and Mr. Mitchell is going to make a statement to the House concerning the open house, and inviting all Members who wish to come. We have invited the Director of the National Science Foundation, Dr. Waterman, and we have invited Dr. Glennan, the head of NASA, the Secretary of Defense, and other officials, including the Speaker and the majority and minority leaders and the whips of the House. I know that all of you will spend as much time as you can in the committee room tomorrow afternoon.

Are there any suggestions? We will have light refreshments made available—I am reporting for Mr. Mitchell here, he is chairman of that subcommittee, but he has told me what the plans are. Who else is on that subcommittee?

Do you wish to report, Mr. Wolf?

Mr. WOLF. The meeting was brief in the extreme. The one I attended was attended over the telephone. I do not feel in a position to report.

The CHAIRMAN. I understand Mr. Miller's subcommittee has completed its hearings.

Mr. MILLER. They have been completed and the report has been submitted to me but I want to make some changes in it. I have not had time.

The CHAIRMAN. All right. We will postpone that. Is there any subcommittee that wishes to make a report now, anyone that has completed the hearings. How about Mr. Sisk? Has he completed his?

Mr. DUCANDER. Yes.

The CHAIRMAN. Mr. Teague will finish his?

Mr. DUCANDER. Yes.

Mr. Anfuso has completed his.

The CHAIRMAN. He will be here later.

Yesterday we had a very good hearing, with the former Chief of the Army Chemical Corps present. Since then I have learned that it is possible to obtain General Stubbs, who is now Chief of the Army Chemical Corps. His testimony, however, will go largely executive, and so sometime next week we will schedule a hearing with him. I understand they have some very good pictures, too, on the effect of the gas in psychochemical warfare. I do not know whether that motion picture will be in open session or executive session, but I am told it is well worth the committee's time to see the effect on troops, when they do not know what they are being subjected to.

I think that covers our business. Is there any other committee business to be brought up?

Mr. WOLF. Later in the week I would like to make a 10- or 15-minute statement on the trip to Paris.

The CHAIRMAN. Yes. Would you please do that when it would not take time allocated to witnesses.

Mr. WOLF. Yes.

The CHAIRMAN. I think it would be a good thing for the committee to have an hour's time on the floor to explain what we have done in this session. At that time I thought we would ask all the committee members who wish to participate, and I hope everybody does—we could get an hour and a half and each member take, say, 3 or 4 minutes to explain some phase of the committee's work. I think it is something the Congress and the country should know about. Mr. King?

Mr. KING. I am sure your idea is excellent and the committee members would participate in the spirit of it. I think there might be wisdom in having the chairman suggest in advance certain areas which the committee members might wish to bone up on. This is a very technical field. If we play the field, we might find 15 or 20 talking about the same thing and other vast areas that need treatment being completely overlooked. So if the chairman would like to suggest, not by way of assignment but just by way of suggestion, that certain areas be covered, then the members could spend some little time boning up on a specific area and speak with some authority.

The CHAIRMAN. That is a good idea and we could ask the staff to analyze what we have done and give you a report on it and suggest appropriate material. If you want to use it, do so.

Mr. WOLF. Thank you, Mr. Chairman.

The CHAIRMAN. It would be submitted more or less in the nature of a report to the Congress. This is a new committee and we would like to have the Congress know what we are doing. I will get an appropriate day when the work is light and give everyone notice. In the meantime, Mr. Ducander, if you will get that analysis of our work, we can get it distributed to the members.

This morning we have two witnesses and we are continuing the hearings on the dissemination of scientific information. The witnesses this morning are Mr. John Green, Director of the Office of Technical Services, Department of Commerce, and Dr. Larkin H. Farinholt, Deputy Science Adviser to the Secretary of State.

I understand Mr. Green is the first witness.

Mr. Green is Director of Technical Services from the Commerce Department. He is a graduate of Annapolis and Georgetown University. He is a career Government official. His services have been recognized by our own and other governments. For example, he received an award for his scientific effort from the Secretaries of the Army and Navy, His Majesty's Medal for Services in the Cause of Freedom from the British Government and the Gold Medal for Exceptional Public Service from the Secretary of Commerce. So we do have a distinguished witness this morning in the person of Mr. John C. Green, and we are pleased to have you here, Mr. Green.

STATEMENT OF JOHN C. GREEN, DIRECTOR OF TECHNICAL SERVICES, DEPARTMENT OF COMMERCE [11]

Mr. GREEN. Thank you, sir.

Perhaps a brief history of the scientific information activities of the Department of Commerce since 1945 will be of value to this committee. I will restrict these comments to the efforts carried out by my own office. However, you will recognize that the Department's important scientific and technical agencies, such as the National Bureau of Standards, the U.S. Coast and Geodetic Survey, and the Weather Bureau, each have extensive information programs pertinent to their responsibilities.

At the close of World War II, it was considered that the military research and development which had been held secret during the war years should be declassified and distributed. Such a measure was intended to speed conversion from a wartime to a peacetime economy. Accordingly, on June 8, 1945, President Truman signed Executive Order 9568. The language of this order defines a national policy which favors the declassification and dissemination of scientific research when considerations of national security so permit.

A Publications Board, comprising five Cabinet officers, is described in the order. At the first meeting of the Board, operational responsibilities were entrusted to the Department of Commerce and this resulted in the creation of the Office of Technical Services.

Shortly after we had begun to function under this Executive order, President Truman signed a second Executive order, No. 9604. This substantially expanded the scope of our efforts to encompass German and Japanese science and technology. It was under this latter order that we and the Department of the Army collaborated on a most intensive exploitation of foreign scientific and technical information.

At the height of that activity there were nearly 1,000 people, a combination of German and American, actively functioning in this program. We had "location" teams which leapfrogged across Germany visiting scientists, research institutes, and industry, locating personnel to be interrogated and records to be analyzed. These teams were followed up by investigators accompanied by microfilm teams who photographed the original records for cataloging and dissemination here.

Some 600 American experts participated in this activity, preparing reports in English based on their findings. Equipment was removed and brought here for demonstation and tests. Outstanding German scientists were transferred. In addition, all pending patent applications were photographed in the Berlin Patent Office.

Perhaps most important, 600 outstanding German scientists were recruited to write reviews on scientific developments. When accomplished, these reviews totaled 84 volumes and summarized the

[11] Born Washington, D.C., March 2, 1910, son of Kirt and Linda Green; B.S., U.S. Naval Academy, Annapolis, Md., 1934; L.L. B., Georgetown University Law School, Washington, D.C., 1940; Examiner, U.S. Patent Office, 1936; engineer, National Inventors Council, 1940; chief engineer, National Inventors Council, 1944; Executive Director, National Inventors Council, 1957.

At the close of World War II, Secretaries of War and Navy indicated appreciation for services rendered by presentation of scroll "For patriotic service in aiding the prosecution of the war—stimulating, guiding, and evaluating inventions for the benefit of the Armed Forces, 1940–46."

Executive secretary, Publications Board, 1945; Director, Office of Technical Services, 1945; adviser to Economic Cooperation Administration (now International Cooperation Administration), 1948; director, exchange program with Soviet and satellites, 1957.

In addition to the citation from Secretaries Forrestal and Patterson, Mr. Green has been accorded His Majesty's Medal for Services in the Cause of Freedom and the Department of Commerce Gold Medal for Exceptional Public Service.

significant developments in Germany from 1939 to 1945, the years when she was cut off from general communication.

The job of collection was substantially accomplished and the job of organization was in the early stages when the Congress raised a legislative point of order questioning the authority for the effort. This resulted in a speedy "close down" and disposal of the unanalyzed records. The Department felt that the Executive order had spelled out a desirable authority.

Therefore, we sought specific legislation. This was obtained when the 81st Congress passed Public Law 776 in September of 1950. It will be noted that this legislation directs the Secretary of Commerce to set up a clearinghouse for scientific and technical information and gives him broad authority with respect to the collection of the materials to be included in such a clearinghouse.

Since the Federal Government is financing roughly half of the total scientific effort in this country, it seemed to us that the best use of our resources was in the announcement and distribution of Government-sponsored efforts.

Accordingly, we established close cooperative links with the four primary sponsors of research within Government—these are the three armed services and the Atomic Energy Commission. Our program in disseminating Government research has occupied our major attention until this fiscal year. Under it we announce about 10,000 titles and sell 300,000 reports annually.

Shortly before the Russians announced the first sputnik, our friends in the National Science Foundation called all pertinent Government agencies together to see what might be done to speed the release of translations, abstracts, reviews, and similar materials prepared by Government units for internal use. It was generally agreed that the Department of Commerce was the logical communications mechanism between the Government and the scientific community. When this matter was brought to the attention of the Secretary of Commerce, he agreed to seek funds for a clearinghouse of foreign science and technology to collect, catalog, announce, and supply such information. Our request for the clearinghouse was approved and we began this operation in the current fiscal year.

Mr. FULTON. What law was that?

Mr. GREEN. Public Law 776, 81st Congress.

Mr. FULTON. What was your authorization here on page 3 of your statement?

Mr. GREEN. It is the same authorization, sir. The scope of that bill is foreign and domestic. We had not approached the foreign before.

Since I understand the emphasis at these hearings is on the accessibility of foreign scientific information to the American scientist, I will go into some detail on what we are now doing.

First, we are offering English translations of three series of the abstract journals known as Referativnyi Zhurnals produced by the Soviet Institute of Scientific Information. These three series are physics, biology, and chemistry. These translations will be increased to encompass additional areas of science shortly.

Second, twice each month we distribute a report prepared by the Central Intelligence Agency which summarizes significant Soviet scientific developments.

Third, we are distributing a weekly journal on Soviet activities in the international geophysical field.

We are distributing cover-to-cover abstracts of 90 leading Soviet scientific and technical journals. These abstracts, obtained under a cooperative program with the Air Force, are available in a short period of time after the original Russian journals are on the street in Moscow.

We distribute Government-prepared translations of selected Soviet bloc materials. Current estimates are that these will run about 10,000 titles a year.

We are producing a carefully indexed journal titled "Technical Translations," which identifies translations made in and out of Government. This journal relies in large measure on the cooperation of the Special Libraries Association, other Government agencies, private translators, and cooperating foreign governments.

For example, through the Special Libraries Association's Cooperative Center we obtain translations made by private industry, universities, and others. Commercial translators assist us by making their activities known to our clearinghouse.

We have a network of six depository libraries, including the Special Libraries Association Center at the John Crerar Library in Chicago. They are as follows: Massachusetts Institute of Technology, Georgia Institute of Technology, Pennsylvania State University, Carnegie Library in Pittsburgh, and the University of California at Los Angeles.

We are providing a reference service for these materials whereby inquiries as to translations completed or contemplated can be furnished. I should also have mentioned that Technical Translations contains a section titled "Works in Progress" to avoid duplication of effort in translation.

A new and significant development is the "State of the Art" publication which brings together information on outstanding Soviet bloc scientific developments. It seems to us that such reviews will be the keys which help make useful the large amount of foreign scientific information being released. We anticipate between 25 and 50 of such reviews a year.

Another point I should mention is that we are not restricting our efforts to information produced in Government as we do on the domestic side of our program. We are approaching a true clearinghouse on Soviet science and technology since we include materials from industry, from universities, from other governments, and from commercial translating firms and publishers.

I would like to stress the next point.

Our program is essentially a cooperative one. We do not produce translations ourselves. We collect them from all sources and provide a communicating link to the scientific community. Although we are still in the early stages, we have some substantial figures to report in the way of distribution.

For example, since August 1958 over 13,000 issues of the International Geophysical Year Weekly have been sold, 2,750 copies of the Scientific Information Report, and over 16,000 copies of the English abstracts of the 90 leading U.S.S.R. journals. For the period January 2, 1959, to May 25, 1959, individual articles, monographic and book translations sold in paper copy form (plus a few items sold in late 1958) have reached total figure of 8,835. Our semimonthly journal, Technical Translations, has over 1,800 subscribers.

In closing, I should say that we do not rely on Government efforts alone to announce the availability of the material. We have enlisted the cooperation of the technical press and the major abstracting and indexing societies. In fact, we consider their interest and cooperation to be one of the most important factors in prompt and effective distribution.

Thank you.

The CHAIRMAN. That is an excellent statement, Mr. Green, which we are pleased to have and gives us a comprehensive idea of what is being done. I notice you charge for some of these articles. Is that to make this self-sustaining?

Mr. GREEN. Yes, sir. To the degree that we can, we are charged under our public law to make this a self-sustaining operation.

The CHAIRMAN. I want to call to your attention that one of our colleagues, Mr. Fulton, has succeeded in putting in the foreign aid bill a provision that foreign currencies may be used for the scientific and research work overseas. We hope it will stay in the bill and some of us are going to say something on the floor. I am sure Mr. Fulton will. That may be of great assistance to you. Do you think that it would?

Mr. GREEN. Yes; I believe it would.

The CHAIRMAN. It would make the currencies available in certain of those countries and you can employ people over there to do some science and research work that perhaps is not now being done in those countries.

Mr. GREEN. Yes, sir; that is correct.

The CHAIRMAN. Mr. Miller?

Mr. MILLER. No questions, other than I want to compliment Mr. Green on his statement. I think it is a very comprehensive one and a very fine one.

Mr. GREEN. Thank you, Mr. Miller.

The CHAIRMAN. Mr. Fulton?

Mr. FULTON. The purpose of the amendment is to make available to the President foreign currencies available to the United States, wherever they might be, for the purpose of scientific research and development as well as the translation of scientific books and treatises. It puts it to the discretion of the President to spend such sums in the manner he deems best. The trouble with the amendment is it is not an appropriation in any agency and while we in the House Foreign Affairs Committee were able to get the House Rules Committee to waive points of order which took care of this among two other such amendments for the use of foreign currency, one for education and one for the use of a children's hospital in Poland, nevertheless there is a dispute in the House Appropriations Committee which will come up on the floor this afternoon, and I want to alert the members.

Mr. HECHLER. What is the parliamentary status?

Mr. FULTON. The amendment is in the bill now at the House Foreign Affairs Committee level so the clean bill as introduced has this provision in the bill. I understand Mr. Bentley, of Michigan will have an amendment to try to strike it out. He is opposed to the whole mutual security bill, I understand, and would then try to limit it in any regard he could. I am more concerned about the fact that if there is an attempt to put this under the Appropriations Committee it will then be charged against the total amount of the appropriation of a particular agency. The trouble so far in the use of foreign currencies

that the United States has available is that no U.S. Government agency wants to be charged in dollars for the amount of these foreign currencies. They would rather spend them themselves. And secondly, they do not want to go into the general field of translating scientific books and treatises that are of general use to the scientific community but hardly in direct use to the agency in its current fiscal year of activity. So I am trying to get it put at the discretion of the President, who can then allocate the funds to the various projects and there can be a joint effort by the various agencies together with the Government and foreign governments to work out the expenditure of these funds for translations and similar purposes.

The CHAIRMAN. May I say this: It does arise out of discussions of the hearings in this committee and all of the committee ought to be interested in it and I hope we can keep it in there.

Mr. FULTON. Yes, sir. I have said to the Foreign Affairs Committee it arose out of our testimony here as well as the comments of many members and I was putting it into a form satisfactory to the House Foreign Affairs Committee. Actually, had we had the bill before us that had already passed our own agency, I would have asked that it be put on that.

The CHAIRMAN. Now, are there any further questions from any member of the committee?

Mr. Green is here and he is ready to answer them and I believe he can, too.

Mr. FULTON. Would you yield just a moment?

The CHAIRMAN. Yes.

Mr. FULTON. I want to say to my good friend, the gentleman from Indiana, this use of foreign currency will be determined by scientific people as distinguished from the use of foreign currency for a children's hospital in Poland. I can see the appropriation as different. It will be impossible to set up these projects by a money counter, and I am sure if we try to put these under a particular agency we will lose in the overall approach of the translating of these scientific treatises and textbooks. I know the gentleman from Indiana has an amendment on these appropriations. But I want to distinguish it from our scientific approach. That is put to the President who assigns the various agencies the function. I would ask the witness, do you agree with that?

Mr. GREEN. From an operational point of view, I would think it much more effective that way, because otherwise you will have a number of Government agencies independently operating abroad.

Mr. ROUSH. Does this mean the funds would come within this 30-percent transfer provision or is there any provision under which the President can distribute and assign these scientific funds.

Mr. FULTON. No. The 30-percent transferability provision refers to the military aid title I funds that are new for this year, and the fiscal 1959–60 bill or the funds that are in the pipeline. We are going to provide a transferability from military to economic aid of funds that are authorized by this bill.

These funds are often called counterpart but are not restricted to that and are already either in banks or in funds, everywhere from the U.S. Treasury, to banks abroad, held individually or jointly with other countries or agencies.

These funds are foreign currencies and they have once been appropriated and they are the result of the foreign aid program dollars being lent or goods sold, and then foreign currencies taken in return.

The CHAIRMAN. Well, I think it will be explained on the floor, and so I suggest that everybody be there. I think it is a good amendment and I hope we can keep it.

Mr. FULTON. Thank you, Mr. Chairman.

Mr. MOELLER. Mr. Green, while I realize that the agency you are working with is primarily a clearinghouse, are you aware of any information that has been gathered particularly from Soviet writings, that have contributed much to our scientific knowledge here? I am thinking primarily in the field of health, the study of cancer and heart disease and so on. Are our scientists picking up information that is valuable to us in these areas?

Mr. GREEN. Yes. I think it is true. It is too early to speak of something traceable to our program that started this year. But Senator Hennings queried some 17 Nobel prize winners and in the responses which he disclosed the other day there are four or five medical examples, one or two of which I think are Soviet.

The CHAIRMAN. How much money did you have appropriated?

Mr. GREEN. $200,000 domestic and $510,000 foreign.

The CHAIRMAN. You had $710,000?

Mr. GREEN. Yes, sir.

The CHAIRMAN. Domestic and overseas?

Mr. GREEN. Yes.

The CHAIRMAN. Did you ask for more than that?

Mr. GREEN. The Department asked the Bureau of the Budget for an amount slightly more than that. About $125,000 more.

The CHAIRMAN. It has been reduced by $125,000?

Mr. GREEN. Yes, sir.

The CHAIRMAN. Was this for the domestic or overseas?

Mr. GREEN. That is both together. We merged them because it is more efficient.

The CHAIRMAN. This year you got $125,000 less than you asked for?

Mr. GREEN. We believe we will.

Mr. FULTON. Would you yield on that point? Who was it received the Appropriations Committee cut of $1,400,000 to the fiscal year—what agency?

Mr. GREEN. I believe the National Science Foundation was asking for a million four more and they were held at the current level.

The CHAIRMAN. Would you give us what the current level is?

Mr. GREEN. There is a gentleman from the Science Foundation in the audience. I think it is $3.6 million.

The CHAIRMAN. Are you with the National Science Foundation?

Mr. ODETTE. Yes, sir.

The CHAIRMAN. What is your name?

Mr. ODETTE. Ralph Odette. I am special assistant to the head of the Science Information Service of the National Science Foundation. I do not have the specific budget figures in memory but approximately $3.6 million was the fiscal 1959 level. Our request for fiscal 1960 was $1.4 above this for what we considered to be necessary program expansion, as I believe was brought out by Dr. Waterman when he appeared before this committee. The House Appropriations Committee did

not specifically reject any part of the request, but stated that the total request for information work in the foundation should be kept at the figure we had in 1959.

The CHAIRMAN. Yes. They cut it. They reduced your request from approximately $5 million to $3.6.

Mr. FULTON. May I ask the gentleman who just spoke whether he favors the proposal that I have been able to get into the mutual security bill that is now being discussed?

Mr. ODETTE. Yes, sir. There is no question of the usefulness of this proposal.

The CHAIRMAN. That will fortify you on the floor.

Mr. FULTON. Thank you.

The CHAIRMAN. Well, if there are no further questions to Mr. Green, we appreciate very much your being here and the very fine statement. Now we have Dr. Larkin H. Farinholt, Deputy Science Adviser to the Secretary of State.

Dr. Farinholt was given the oath of office in 1958. His background includes university teaching and administration. He has taught at Washington and Lee University, Lexington, Va., and is presently on leave from Columbia University as a member of the chemistry faculty. He has held various administrative positions with civilian scientific organizations and was a science attaché at the American Embassy in London.

We are certainly pleased to have you, sir, and we will appreciate the statement you have.

STATEMENT OF DR. LARKIN H. FARINHOLT, DEPUTY SCIENCE ADVISER, DEPARTMENT OF STATE [12]

Dr. FARINHOLT. Thank you, sir.

My statement will concern only the contributions which the scientific attachés of the Department of State are making to the exchange of scientific information. In order that you may place their activity in this field in proper perspective, however, I would like to tell you first of the general situation which led to the assignment of scientific attachés to our principal embassies.

The present science program in the Department of State had its roots in a number of studies made during and shortly after World War II. The first of these was undertaken by Dr. Vannevar Bush at the request of President Truman, and was published in 1945 under the title, "Science, the Endless Frontier."

Another study, "Science and Public Policy," by the President's Scientific Research Board under John R. Steelman, was carried out in 1947. These studies showed how the lessons learned in the great scientific effort made during the war might be applied to the problems of peace. They also explored the inter-relations of the scientific

[12] Born Baltimore, Md., 1905; did undergraduate work at Johns Hopkins University; in 1931 received Ph.D. in chemistry from Oxford University in England, which he attended as a Rhodes scholar.

During World War II he was executive officer of the Explosives Research Laboratory, operated by the National Defense Research Committee of the Office of Scientific Research and Development, and also held other administrative positions with this civilian scientific organization. Until he was called away for these wartime activities in 1941, he taught at Washington and Lee University.

Since 1947 he has been a member of the chemistry faculty of Columbia University, and is presently on leave to serve as Deputy Science Adviser to the Department of State.

During 1951–52 he was science attaché with the American Embassy in London, and from 1954–57 he served as a member of the Committee on the International Exchange of Persons of the Conference Board of Associated Research Councils.

Dr. Farinholt was appointed Deputy Science Adviser to the Department of State on June 17, 1958.

activities of the various Government agencies, and offered recommendations as to how they might be coordinated. Both studies brought out the growing impact of scientific advancement on international relations, and suggested that scientists, as Government officers, could perform useful work in the conduct of those relations.

During the reorganization of the Department in 1949, the responsibilities of the Department of State in international science were reviewed; and as a consequence of these studies, a Department of State International Science Steering Committee was formed under the chairmanship of Lloyd V. Berkner. Under the guidance of this group, with the assistance of an advisory committee of the National Academy of Sciences, and with the help of numerous individuals both within and outside the Government, the Department of State issued in May 1950 a report entitled "Science and Foreign Relations." This document, usually referred to as the Berkner report, noted "the increasing importance of science and technology on foreign affairs as well as the profound effect the administration of foreign relations has upon the program of science and technology." It recommended that provisions be made in the Department and in embassies abroad for the proper consideration of science and technology in their relation to our foreign policy.

In order to accomplish this objective, the report advocated the creation of a science office in the Department, headed by a science adviser to the Under Secretary of State. This position was established, and Joseph B. Koepfli was appointed Science Adviser early in 1951. Also as part of this program, science offices were set up in selected U.S. missions abroad, and distinguished scientists were appointed for limited terms to serve as scientific attachés. After getting off to a promising start and operating successfully for a time, the program, primarily for budgetary reasons, slowed down and eventually came almost to a halt. However, during 1957 it was decided to reactivate and revitalize the program; and early in 1958 Wallace R. Brode, Associate Director of the National Bureau of Standards and president of the American Association for the Advancement of Science, was appointed as Science Adviser to the Secretary of State.

Almost immediately, the Science Adviser set about recruiting outstanding U.S. scientists who had had experience in international relations in science to serve as scientific attachés. At the present time four attachés and one deputy are serving in the Embassies at London, Paris, Rome, and Stockholm. An attaché and deputy are currently being briefed in Washington for their assignment to Tokyo, and I may add they are leaving tomorrow. They have just finished their briefing session of 3½ weeks.

Others have been appointed or are being planned for Bonn, New Delhi, Moscow, and Latin America.

Typical of these attachés is Dr. Julian E. Mack, Science Attaché at Stockholm. Dr. Mack, a physicist, has been a member of the faculty of the University of Wisconsin since 1930 and professor of physics since 1950. He received his Ph. D. from the University of Michigan in 1928 and during the period 1928–30, he held National Research Fellowships at Princeton University, University of Michigan, University of Minnesota, and at the University of Uppsala in Sweden. From 1941 to 1943 he was a visiting member of the faculty of Princeton University. During World War II, from 1943 to 1946 he was a

physicist at the Los Alamos Laboratories after which he returned to his academic duties at the University of Wisconsin. In 1950–51, he held a John Simon Guggenheim Memorial Fellowship at the University of Lund, Sweden. An expert in interference spectroscopy, Dr. Mack has participated in the Joint Commission of Spectroscopy of the International Council of Scientific Unions.

The point this sketch is intended to emphasize is that the pattern of work designed for scientists is an integral part of the larger organization and functioning of the Department of State. The Science Adviser and his staff and scientific attachés and their deputies are officers in the Department and Foreign Service respectively, and constitute an integral part of the corps of personnel engaged in the daily task of carrying on foreign relations. In this complex business, men with various training and background are required to collaborate with each other on a variety of matters. In these modern days, men with training and experience in the natural sciences are needed for precisely the same reasons that the Department's operations require political scientists, economists, lawyers and other specialists.

Thus, the primary function of the scientific attachés is to assist in the Department of State's business of developing foreign policy and carrying on foreign relations. Their work, accordingly, is focused on helping to cope, in collaboration with other Embassy officers, with those problems arising from science that actually or potentially affect our relations with other governments.

In discharging these responsibilities, scientific attachés keep the Department currently informed of developments significant for foreign relations. These would include plans for major scientific research programs in foreign countries by government or private agencies, relations between the foreign government and scientists or research institutions and the impact of U.S. policies in science or foreign relations on the scientists of the country to which they are assigned.

In addition to the above, the scientific attachés are responsive to the information and other requirements of Government departments and agencies that carry on scientific programs but they do not normally engage in collecting scientific information for dissemination by the Department to scientists outside the Government.

Incidentally, the Department's functioning does not require it to disseminate information to scientists in universities, laboratories, and other scientific institutions. Moreover, the Department has no facilities for this type of distribution. The science attachés will, nevertheless, facilitate other Federal agencies and private organizations in carrying out their programs of scientific cooperation in exchanging information.

In many embassies abroad, there are already specialized attachés who look after the information and liaison needs of such Government agencies as the Departments of Agriculture and Commerce and the Atomic Energy Commission. These work closely with the political and economic officers of the embassy and the science attaché, where one is assigned, to insure their actions are consistent with U.S. foreign policy objectives.

In a similar manner, if upon due consideration, it is deemed necessary to place specialists in the field of scientific information abroad, the science attaché, together with other embassy officers, would work

closely with them to insure maximum benefit to the Government and to U.S. science.

The scientific attachés have unique contacts in the highest circles of the U.S. and foreign scientific communities. They can be of great assistance in the collection of foreign scientific information by other agencies. In view of their other functions, more directly connected with the business of the Department of State, however, it would be a serious error to divert them to the collection of scientific reports for dissemination to the U.S. scientific community in general. They can better serve the Department of State and the scientific community by promoting and facilitating the exchange of information than by becoming directly involved in the process itself.

In summary, the work of the Science Adviser in the Department of State proceeds, on the one hand, from the obvious fact that, more and more, scientific activities are affecting our foreign relations. This fact makes it imperative that these activities here and abroad be recognized and indentified, their implications and their potentialities for foreign relations be evaluated, and when appropriate, their impact be brought to the attention of the Department of State.

On the other hand, the conduct of foreign relations is increasingly influencing scientific progress. This side of the coin requires that the objectives of scientific activities and our political, economic, security, and other national objectives be reconciled. In this context, the scientific attaché is endeavoring to insure that the maximum benefit to our foreign relations and scientific progress is realized from international scientific activities. As a scientist he is vitally interested in promoting scientific progress by encouraging international meetings, scientific cooperation such as the International Geophysical Year, and the exchange of scientific persons and information. He recognizes that the exchange of scientific information is vital to the progress of science. In view of the other responsibilities placed upon him, however, his functions in this field are directed toward facilitating the work of others more immediately concerned with this objective.

Thank you.

The CHAIRMAN. Thank you very much, Doctor, for your statement. How much money does the State Department spend on this type of work?

Dr. FARINHOLT. As I recall, our budget for this coming year is something in the neighborhood of $600,000. But we probably will not utilize all of that, because the program is not in full operation yet. But we will utilize most of it, I think.

The CHAIRMAN. What is holding your program back then?

Dr. FARINHOLT. Well, it takes time to locate the proper persons, to have them make arrangements with their universities or with their organizations, Government organizations or with industry as the case may be. Clearance takes a while, of course, usually 3 or 4 months. We expect to pick persons as deputies, for example, who will be in a field of science which is different from the field of the senior man at the post.

We originally proposed nine different posts in which we will have scientific attachés, two at each post, a senior man and a deputy. Our senior man in Stockholm, for example, does not have a deputy yet. He will, we hope, in the next few months.

The CHAIRMAN. You are going to have nine offices?

Dr. FARINHOLT. Nine; London, Paris, Bonn, Stockholm, Rome, Moscow, New Delhi, Tokyo, and South America. I say "South America" because in that particular area instead of having two men in one post we plan to have two men at the same level, one in Buenos Aires and one at Rio.

The CHAIRMAN. You mean you have in all of South America two men?

Dr. FARINHOLT. So far. In the future we hope to expand this program.

The CHAIRMAN. There is a demand in that area for more than that number of attachés.

Dr. FARINHOLT. We also plan in the future to have regular Foreign Service officers with scientific backgrounds assigned to a number of these posts which have scientific potential, but which are not among these nine posts.

The CHAIRMAN. Do you have a man in Japan?

Dr. FARINHOLT. We have two men leaving the Department tomorrow who are going to Japan.

The CHAIRMAN. Would it be better to have an attaché in the field of science as you plan, or would it be better to have someone directly from the National Science Foundation in your Embassy?

Dr. FARINHOLT. In Japan, for example, where there are a number of Government agencies entering the field of scientific information and exchange, including the three armed services, the Science Foundation and other groups, we hope to have the whole scientific effort coordinated under the general direction of the science attaché in the Embassy.

The CHAIRMAN. Then you have representatives from the three armed services and from the National Science Foundation?

Dr. FARINHOLT. How that is going to be worked out has not been exactly pinpointed yet. We have not worked it out.

The CHAIRMAN. How about NASA?

Dr. FARINHOLT. NASA also.

The CHAIRMAN. You would have a staff and your attaché in charge of science would be in charge of it?

Dr. FARINHOLT. Just the way it is to be coordinated is not worked out yet. Dr. Brode, Science Adviser to the Secretary of State, has had several meetings at which he discussed the matter with the various agencies involved. We are trying to set up something so there will be a coordination of these efforts.

The CHAIRMAN. Should you have this worked out before January?

Dr. FARINHOLT. I think before then. As soon as our scientific attachés get to Tokyo, Ambassador MacArthur is very much interested in this and they are going to get down to work as soon as they get there.

The CHAIRMAN. Mr. Fulton, do you have a question?

Mr. FULTON. Why is not the program pushed more and why are there not plans for more scientific attachés. For instance, in the plans you mentioned, it is obvious there is not one for all of Africa.

Dr. FARINHOLT. Again, once the program is in operation, we are going to expand it.

Mr. FULTON. It sounds as though you are not going to use all of the money available to you and appropriated for programing.

(No response.)

Mr. FULTON. Why is that? I cannot imagine you letting one day go by without having somebody right on the spot in Moscow. What is the reason for that? You can cross too many t's and dot too many i's to get exactly the right person. Are we not interested in what they are doing enough to want somebody on the spot every day?

Dr. FARINHOLT. Yes, as far as the Moscow spot goes that is a very ticklish place to start the program. If we send a man there who is not well known among the Russian scientists, he would not get to first base.

Mr. FULTON. I can cite you Dr. Singer, who is at the University of Maryland. He is leaving tomorrow on the invitation of the Academy of Science of Russia.

Dr. FARINHOLT. They have just appointed as a consultant Dr. Turkevich of the University of Princeton, an expert on Russia who speaks Russian and has been there many times. He is going there this summer and get things lined up. We have a number of persons under consideration for that post.

Mr. FULTON. Why are you not getting action? Because this program has been off again on again? I am on the Foreign Affairs Committee. It seems to me if it is going to be done it should be done immediately. If the State Department is not going to do it I would suggest it be some other agency, for example, the Department of Commerce could have somebody there, and the military attachés are not under the Department of State nor are the cultural attachés.

Dr. FARINHOLT. I think we are making substantial progress.

Mr. FULTON. You state you have appointed and planned. Would you give us the date on the planning stage and the appointments?

Dr. FARINHOLT. I can give you who is abroad at the moment.

Mr. FULTON. Just the ones you mentioned here on page 2 of your statement and others have been appointed or are being planned for Bonn, New Delhi, Moscow.

Dr. FARINHOLT. For Bonn we have Professor Audrieth from the University of Illinois. He is the professor of inorganic chemistry there.

Mr. FULTON. Has he been appointed?

Dr. FARINHOLT. Yes.

Mr. FULTON. Has the one been appointed to New Delhi?

Dr. FARINHOLT. We have tentatively appointed one. But his processing has not been completed yet.

Mr. FULTON. Moscow?

Dr. FARINHOLT. He has not been appointed. We have a consultant, Dr. Turkevich, who is going there, to help get the groundwork laid.

Mr. FULTON. Why is there no appointment of an attaché or deputy to Moscow?

Dr. FARINHOLT. It is very difficult to find suitable persons who speak Russian for one thing. We expect—we have several people pretty well lined up but we don't want to appoint them there until we lay the proper groundwork in Moscow itself.

Mr. FULTON. I don't see how you can afford to let one day go by without scientific coverage of Soviet and Communist China. I think it is a dangerous situation.

Dr. FARINHOLT. Well, we are doing what we can.

Mr. FULTON. How about Latin America?

Dr. FARINHOLT. For Latin America, we have a number of people lined up for that post, but nobody has been appointed yet. We hope to have appointments announced fairly shortly.

But we have people in most of the other posts. Our man for Bonn came to the Department this week. I did not mention this in my statement since the latter was prepared several weeks ago.

Mr. FULTON. In your statement on page 1 you say, "After getting off to a promising start and operating successfully for a time the program primarily for budgetary reasons slowed down and eventually came almost to a halt." I was on the Foreign Affairs Committee when that happened and know about that. But I would say at the present time you have more money than you need. We on the scientific committee of the House should be interested in seeing that proper coverage is made of these key spots in the world. As a matter of fact, I do suggest you could go much further than the nine posts.

Dr. FARINHOLT. We do plan to do so.

The CHAIRMAN. Would the gentleman yield?

Mr. FULTON. Yes.

The CHAIRMAN. It does seem to me the State Department does not appreciate the real importance of this or it would have been pushed a little harder. Perhaps another agency, say the National Science Foundation, may be preferable, if they put in their own people. But at any rate it seems to me we ought to move ahead.

Dr. FARINHOLT. As far as the exchange of information goes, the Science Foundation does plan to do just that.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. I have every confidence in Dr. Brode, whom I know very well. I discussed this with him informally. I think he is trying to do the job, but there is no good accomplished in just filling slots if you have not got the people who are competent to fill them. That is not going to serve your purposes. You have got to place people in Russia who, as has been pointed out, will be acceptable to the Russians, or they are going to see nothing and know nothing. One of the outstanding U.S. scientists was mentioned in connection with the Moscow post. Would he leave Maryland to go over to Russia? I can understand the sense of your general situation and the frustrations that hit all of us in this field. In the field of science, just to appropriate money and to hire new people does not do the trick. You have got to go a lot deeper than that.

Mr. FULTON. Would the gentleman yield?

Mr. MILLER. Yes.

Mr. FULTON. You did use a good phrase there, "sense of your general situation." We would agree on that, and I am sure there is a unanimous feeling on this committee, of a sense of urgency to get going and have the posts adequately set up and manned with competent people.

Mr. MILLER. That is right. That is the next thing—getting them manned with adequate people.

Dr. FARINHOLT. I can assure you we have a sense of urgency about this ourselves.

Mr. MILLER. I think, frankly, to bring these people up here and criticize them and say to a man, or men who are working their hearts

out, trying to do this job, "Well, why don't you do this faster?" is not rewarding them for the work that they are doing and has a tendency to perhaps slow rather than hasten. That is the thing that concerns me, in this whole field, when we try to press people, in a field, and no one knows better than you, my colleague from Pennsylvania, that in this field of research, you can just go so fast, and all the money in the world is not going to solve it.

So I would like to say that I think that Dr. Brode and his associates down there are doing a good job and doing it as competently as it can be done, and I certainly would be inclined to criticize them if just for the sake of filling posts they went out and picked people who were not thoroughly fitted for those posts. Then I think they would be subject to severe criticism.

Mr. ANFUSO. Dr. Farinholt, different branches of our Defense Department, like the Navy and the Air Force and the Army, have various research projects going on, in Western Europe. Is that correct?

Dr. FARINHOLT. That is correct.

Mr. ANFUSO. We have a project going on in Bonn and in Belgium. I did not hear you mention Brussels. Do we have an attaché there?

Dr. FARINHOLT. No. But we have two men in Paris. And in our proposed budget request for 1961, we have asked for an attaché in Brussels.

Mr. ANFUSO. We have a project there in Brussels.

Dr. FARINHOLT. The Air Force has one there. And the Army has one in Frankfurt.

Mr. ANFUSO. Then we have one at La Specia, in Italy, is that correct?

Dr. FARINHOLT. That is right. That is in NATO—under NATO.

Mr. ANFUSO. And then in Paris.

Dr. FARINHOLT. Yes.

Mr. ANFUSO. That seems to be the headquarters for the NATO efforts in this regard. Is that right?

Dr. FARINHOLT. Yes.

Mr. ANFUSO. Is there liaison between the State Department and the armed services?

Dr. FARINHOLT. Yes. Very definitely. As a matter of fact, there was a joint meeting of the three services' oversea operations in Brussels about a month ago, and our science attachés from Paris, Rome, Stockholm, and London attended that meeting.

Mr. ANFUSO. Good.

Dr. FARINHOLT. And we sent a representative from the Department, from our office, and they all met together.

Mr. ANFUSO. You spoke about the difficulty of getting scientists for Russia who know the language.

Dr. FARINHOLT. We have a number in mind right now, but it is a problem, of course.

Mr. ANFUSO. You know that we have had visiting American scientists in Russia for a long period of time.

Dr. FARINHOLT. Yes.

Mr. ANFUSO. And as a matter of fact, there is an association called the International Astronautical Association which is composed of scientists from all over the world. They are going to have a conference in London from August 31 to September 5.

Dr. FARINHOLT. Yes.

Mr. ANFUSO. Have you ever approached that association to try to give you some scientists who can speak the language?

Dr. FARINHOLT. We have been looking into the problem of finding suitable persons, yes. I don't believe we approached them as a body, but we certainly have approached individuals who are members of that organization.

Mr. ANFUSO. I certainly want to say this, and not by way of criticism, because I think everybody is trying—after all, this is something new, the State Department is working diligently, and the Defense Department is, and I know about these private projects, but there is a sense of urgency and I know we should do all we can in a spirit of cooperation to get the program moving faster.

Dr. FARINHOLT. I agree with you thoroughly.

Mr. ANFUSO. I might suggest, Mr. Chairman, we should have in the near future a committee such as ours delve into the subject and see what can be done to stimulate this program.

Mr. FULTON. That is a good point.

The CHAIRMAN. That is an excellent idea.

Mr. Mitchell?

Mr. MITCHELL. I understand there was a comment a few moments ago whether the State Department should be in this field. It seemed clear to me from page 2 of your statement, and I am quoting from it, "the primary function of the scientific attachés is to assist the Department of State's business of developing foreign policy and carrying on foreign relations."

Dr. FARINHOLT. Yes.

Mr. MILLER. So this is a specialized job.

Dr. FARINHOLT. For that reason it is essential the State Department do it.

Mr. MILLER. In conducting international affairs.

Dr. FARINHOLT. It is tied up with foreign affairs.

Mr. MILLER. These men must receive some training before they are sent to these missions.

Dr. FARINHOLT. All of our people going abroad have had previous experience in the countries to which they are assigned. They spend 3½ or 4 weeks here in Washington, being briefed in the Department, in the National Science Foundation, in AEC, NASA, the National Academy of Sciences, and all the other organizations in Washington. They spend a very, very strenuous period of 3 or 4 weeks.

Mr. MILLER. To sum up, Doctor, the State Department's position on this question is you think the other departments and their work and their goals are different from yours and therefore, definitely, you should have a science adviser in as many places throughout the world as possible?

Dr. FARINHOLT. We would like to have as many as possible.

Mr. FULTON. Would the gentleman yield?

Mr. MITCHELL. I am through.

Mr. FULTON. Are these people FSO?

Dr. FARINHOLT. They are FSR. They are not permanent in the State Department.

Mr. FULTON. So they are not coming in by lateral entry as FSO's?

Dr. FARINHOLT. Not as FSO's, but as FSR's.

Mr. FULTON. They are not coming in through bilateral entry as FSO officers?

Dr. FARINHOLT. It is conceivable if some of them should be with the Department for more than 3 or 4 years perhaps they could come into the regular Foreign Service.

Mr. FULTON. And there are no people, then, presently employed, who are in the FSO category? They are all FSR's.

Mr. FARINHOLT. That is right.

Mr. FULTON. Is this the intention to make them FSO later on at what time?

Dr. FARINHOLT. Most of the people appointed so far are on leave from universities or Government positions.

Mr. FULTON. That sounds as if it is a temporary program and the point of my question is, are you really going to have this as a part of the Foreign Service officer organization, so that we should plan on it and this committee should look into the method of hiring and the method of retaining?

Dr. FARINHOLT. There is one other aspect which I did not mention before and that is that we plan, in the future after the program is going, to utilize the services of regular Foreign Service officers who have had a scientific background. You would be surprised what a large number do have a scientific background.

Mr. FULTON. But they come through the Foreign Service?

Dr. FARINHOLT. Yes, they are already in the Foreign Service, and these Foreign Service officers will be appointed to some of these other posts, such as Manila, Canberra, and places where we do not have regular science officers and they will spend perhaps a quarter of their time on scientific activities along with their other duties. They will be picked on the basis of this training and background. This is something we plan to do.

The CHAIRMAN. Mr. Moeller.

Mr. MOELLER. I am interested in the guidelines you use in the recruiting of this personnel. This committee is vitally interested in what is going on here in America in the field of science and particularly the teaching level. Now, are we robbing Peter to pay Paul? Are you latching onto topnotch instructors and professors at our colleges and universities that we need for teaching? Could you go to industry to pick suitable people?

Dr. FARINHOLT. We are happy to have them from universities or industry.

Mr. MOELLER. But do you have that in mind?

Dr. FARINHOLT. Yes. The program and the number of people involved is, of course, relatively small compared to the problem here at home.

Mr. MOELLER. What particular type of scientist is most in demand now?

Dr. FARINHOLT. Do you mean in this country?

Mr. MOELLER. No, for your particular program.

Dr. FARINHOLT. Well, we want some one of distinction, a person who is well known internationally, a person who has the confidence of the scientists and a reputation in the country to which he is assigned, a person who understands the people in that country, and a person who the scientists in that country will accept as one of their own. He must be a person of considerable distinction and usually a person of maturity.

Dr. Osgood, who is professor of physics at Michigan State University and dean of the Graduate School there, is now in London. He is the type of person we are considering. He is a physicist. Dr. Walter Ramberg, head of the Mechanics Division of the National Bureau of Standards and quite a distinguished scientist known throughout the world, is in Rome.

In Paris we have Professor Piret and his deputy is Prof. Edward Cox, who retired last year as head of the chemistry department at Swarthmore. Piret is a chemical engineer with a biological background and Dr. Cox is an organic chemist. The man we are sending to Tokyo is Dr. Boss, professor of zoology at Syracuse and his deputy is a younger man, Dr. Crouch, a physicist from Case Institute. Both have had considerable experience in Japan, and both can get along in Japanese which we think is important. These are the types of persons we are concerned with. We are very proud of the persons we have had selected so far. I think we are very fortunate in getting the people we have got.

Mr. MOELLER. That is all.

The CHAIRMAN. Mr. King.

Mr. KING. I wonder if you would discuss in more detail the precise authority of the science attaché. I am not clear in my mind whether they are advisers to our respective ambassadors or whether they are actually to search out information to find out the scientific characteristics of the countries to which they are assigned, with the idea of trying to impart as much of that information to our country as is possible, or just what they are to do.

Dr. FARINHOLT. I think one of their main functions is advisory, and they must work with the other members of the embassy staff in various problems that come up involving science in that country. In order to do that they must have a close and continuing relationship with their counterparts, the scientists in that country, with the various scientific organizations and with the universities and they are expected to visit these places and get around and speak at various meetings and so on.

They also have another function which might be called representational when they would represent the U.S. Government in official affairs, attend scientific meetings in an official capacity and so on. They are also expected to report on significant scientific trends in the country of their assignment. For example, if there is a change in the scientific governmental structure in the country which is of interest to the State Department and to the scientists back home, they will make a study of that and submit a report. But they will not be expected to dig up detailed scientific information. We think of them pretty much, to use a chemical term, as a catalyst in regard to reporting of scientific information. They will assist in the exchange of information by helping the other agencies who are actually doing it. But they will be a catalyst. They will try to promote the process rather than dig up the details themselves.

Mr. KING. I suppose some other agency—and there are many of them—is interested in ferreting out some scientific facts in a particular country, will that attaché cooperate with that agency, too?

Dr. FARINHOLT. Yes, he will do everything he can to help.

Mr. KING. He will sort of open the door and grease the skids and make it easier for these other people to get in the right places to find out what they want?

Dr. FARINHOLT. Yes. Another activity besides the exchange of information is the exchange of persons, the exchange of students and professors back and forth in the scientific field. In the past our scientific attachés have been members of the Fulbright binational committees in the various countries where this program is in operation.

Mr. KING. Suppose the scientific attaché has discovered in the scientific explorations that some great new scientific truth was being born in some country, would he feel some obligation to immediately notify the proper agency?

Dr. FARINHOLT. Oh, yes; of course.

Mr. KING. That is all.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. As long as this conversation has gotten into personalities, and Mr. Fulton has advanced the question of whether these scientists were coming in laterally into the State Department and having done some work on the Civil Service Committee, I don't know that I ever want to see them come into the State Department as Foreign Service officers. If you are going to be a Foreign Service officer it is a lifetime job. Here is the field of science, a field apart, and thinking at this time is that these people should be chosen for their reputations and the contributions that they have made in the field of science and sent to these sensitive positions, just as you are doing now. I am inclined to think the last thing you would want to do would be to regiment a scientist in the State Department, as a Foreign Service officer, who like the officer in the Army has always to worry about what the man upstairs is doing or saying.

Mr. FULTON. That is the point of my question: Whether we do want that.

Mr. MILLER. I think, personally, before we go into it we want to be very certain about this so that we are getting men who will take leave from university and spend 3 or 4 years overseas, and bring a newer approach, and have more receptive minds than if after 10 or 12 years they are continuously faced with regulation, regulation, regulation.

Mr. FULTON. They might talk fellow scientist to fellow scientist, rather than scientist to Foreign Service officer.

Mr. MILLER. That is my point. They are going over to cultivate the desire for knowledge and to command the respect of the scientists of the world rather than the normal exchange that takes place in the State Department.

Mr. FULTON. Would you yield further?

Mr. MILLER. Oh, yes.

Mr. FULTON. For example, for Moscow, I am sure you could get a man of the level of Dr. Cooper of the School of Advanced Studies in Princeton. I am sure he would be glad to volunteer to do a thing like that, where we are without somebody who is going to make it a permanent job and we need somebody with the qualifications in air and space that Dr. Cooper has.

Mr. MILLER. There is more than air and space in this job.

Dr. FARINHOLT. Yes.

Mr. MILLER. Let me say this—biology is one of the important fields.

Dr. FARINHOLT. We have appointed so far more persons in the physical sciences than in the biological field. We are a little heavy

on the former at the moment and we are hoping to appoint more who are in the biological sciences.

The CHAIRMAN. I think you have a vast field.

You are just beginning to dig into it.

Dr. FARINHOLT. Yes.

The CHAIRMAN. Doctor, you said something about a part-time program.

Dr. FARINHOLT. This is not——

The CHAIRMAN. You cannot have a part-time scientist and a part-time diplomat.

Dr. FARINHOLT. I referred to coverage in some of the smaller places where regular Foreign Service officers who have had a degree in physics or chemistry, say, might be assigned. They might spend, perhaps, a quarter of their time in scientific activities in that particular post. They would report, or send in information in the scientific field. They would be a contact point, you might say, for science at that post.

The CHAIRMAN. They would simply transmit information obtainable to a central source?

Dr. FARINHOLT. This Foreign Service officer would be the one person in that smaller embassy where all scientific information would funnel.

The CHAIRMAN. Let me ask you this—you are going to have someone in Moscow—are you going to have someone in Warsaw also?

Dr. FARINHOLT. We have no plans for Warsaw at the moment.

The CHAIRMAN. Czechoslovakia?

Dr. FARINHOLT. Not at the moment.

The CHAIRMAN. Can't you get somebody into those places?

Dr. FARINHOLT. Well, perhaps we could.

The CHAIRMAN. It seems to me there is a good deal of scientific work in Poland and Czechoslovakia and some of those countries.

Dr. FARINHOLT. There is.

The CHAIRMAN. Is there any reason for overlooking them?

Dr. FARINHOLT. No, except I suppose we cannot have science attachés in all the countries.

The CHAIRMAN. Well, as long as your money holds out, you can.

Dr. FARINHOLT. Well, the money is not the—it is a question of getting proper persons, and at the proper time.

The properly qualified people with the language facilities.

The CHAIRMAN. Do you mean this is a shortage of scientists? Is that what you mean?

Dr. FARINHOLT. I would say that as Mr. Moeller said earlier, the scientists in the universities are very busy teaching and carrying out research, and it is not easy to take a man away from his activities.

The CHAIRMAN. It would seem to me in reference to the Iron Curtain countries and that area, a man high up in scientific work who has a background of Russia could help you a lot.

Dr. FARINHOLT. I do not quite understand.

The CHAIRMAN. Don't you have someone?

Dr. FARINHOLT. We have Dr. Turkevich, who will be there just this summer.

The CHAIRMAN. Could he not be of assistance?

Dr. FARINHOLT. He could be of great assistance getting groundwork laid for a more permanent person; yes.

The CHAIRMAN. I want to say this: I am not critical of your program. I was searching for information and making suggestions.

Let me ask you this: Are you able to use funds as suggested by this amendment that has been tied to the foreign-aid program, and could we organize such a program in a foreign country?

Dr. FARINHOLT. I don't see how we could use such funds.

The CHAIRMAN. That could not be used by you?

Dr. FARINHOLT. Not by us but by the National Science Foundation, for example.

The CHAIRMAN. You have no objection to it?

Dr. FARINHOLT. It sounds like an excellent idea.

The CHAIRMAN. Mr. Fulton.

Mr. FULTON. Have you people in the capacity of attachés who can act as informational and transmittal sources?

Dr. FARINHOLT. That is right, but by giving assistance to whoever is doing the actual work.

Mr. FULTON. My amendment is proposed for the people actually doing the work, in the operation.

Dr. FARINHOLT. Yes.

The CHAIRMAN. Would the gentleman yield? My point was this: Could your attaché organize such a program or could he use those funds over there for the employment of people?

Dr. FARINHOLT. I could say he would assist and help someone else to use it.

The CHAIRMAN. That is exactly the point—it could be used for that.

Dr. FARINHOLT. I am sure he would be of great assistance.

The CHAIRMAN. It would not be used to pay your own people, of course, because we appropriate for that. But it could be used to employ someone locally?

Dr. FARINHOLT. Yes.

The CHAIRMAN. And you could cooperate?

Dr. FARINHOLT. Yes.

Mr. FULTON. In reference to your comments on using the people part time, we might inquire as to International Cooperation Administration personnel. They are all under support programs, technical assistance programs, and the special assistance programs; and, likewise, we have the experts on the Development Loan Fund, as well as on the Export-Import Bank that are in these countries, that are scientists, engineers, and very competent people. First, is there any overlapping with the personnel you are going to build up with the people we have in these fields through International Cooperation Administration, and the new Director, Dr. Riddleberger?

Dr. FARINHOLT. I don't see any overlapping at all. I think we can be very helpful to ICA and the other groups that are there.

Mr. FULTON. Will you be using the scientific ICA personnel present in these other foreign countries?

Dr. FARINHOLT. I would say we would use them in the sense that we would cooperate with them and they might assist us.

Mr. FULTON. If some of these ICA personnel are there, does that eliminate the need for your people being there as scientific attachés?

Dr. FARINHOLT. No; because I think their purpose is very different from ours.

The CHAIRMAN. Would the gentleman yield?

Mr. FULTON. Yes.

The CHAIRMAN. Mr. Miller.

Mr. MILLER. Won't the scientific attaché be the man who can coordinate the efforts of the ICA scientists or engineers, to develop their knowledge or the information they obtain. He would be in a position to make a report on it, because in an ICA thing we are concerned with the physical development of the job, whereas what comes back now is incidental, and that in my estimation would abrogate the source of information for the scientific field to cooperate and get the background.

Mr. FULTON. But not to replace.

Mr. MILLER. No; but to supplement.

The CHAIRMAN. The military attaché in a sense is there to handle military matters, and it would seem to me, rather than making this a part of the State Department, it would be a scientific attaché, who would not be a further encumbrance on the State Department but would be a scientific officer like the military has. Is that your idea?

Dr. FARINHOLT. I think that the military operations in various places really are twofold. In some places they have not only military liaison and relations with the military of the country, but in Western Europe, as mentioned earlier, they also give out research grants which are purely for basic research.

It seems to me in the areas where basic research is involved, I think our science attachés would certainly work very closely with the military people.

In the areas of the purely military, weapon development and so forth, I do not think that we would be involved, except in an advisory capacity when scientific advice was needed.

Mr. HALL. Mr. Chairman.

The CHAIRMAN. Mr. Hall.

Mr. HALL. I want to concur in the earlier remarks of Mr. Miller with respect to pressures because of a sense of urgency, and I am sure this committee does not want to leave the impression with you, Doctor, that we want your group to go ahead and fill these slots with just anybody who becomes available in order to get your program underway and spend this money. I think that all of the members of the committee realize that in the event the wrong man is selected for a particular post, he might not only deter our interest in that prospective post, but he might sabotage the whole program. That is all.

The CHAIRMAN. Will the gentleman yield at that point? I notice the doctor says here: "During the reorganization of the Department in 1949, the responsibilities of the Department of State in international science were reviewed." So it is not a new program over there. They have been working on it since 1949.

Dr. FARINHOLT. That is right.

The CHAIRMAN. And I agree with Mr. Miller that there is a sense of urgency, but no crash program. I think that is along your line.

Mr. MILLER. Yes.

The CHAIRMAN. There is no crash program. We do not want to waste any money. But we want to get ahead with the program.

Dr. FARINHOLT. Yes; we do want to get along with it.

Mr. FULTON. I do feel there is a sense of urgency, and feel the spots should be filled promptly with competent people. There is no belief on my part that we should draw by lot to find which of the U.S. citi-

zens fill these spots, nor should we reward scientists who are looking for jobs with these spots.

However, I might say to you that the U.S. policy is promptly to fill top diplomatic posts in each country where we deem it vital. We have either a temporary man appointed as a chargé d'affaires or we get a permanent ambassador or minister quickly. Under those circumstances, if we in the United States act promptly where the top man is concerned in the particular post or country we are speaking of, why don't we use the same sense of urgency to get topflight people and get these posts filled for science? I think we should.

The CHAIRMAN. I think the doctor understands that viewpoint.

Dr. FARINHOLT. Yes; we do.

The CHAIRMAN. And, Doctor, we do appreciate your coming here this morning.

Dr. FARINHOLT. Thank you.

The CHAIRMAN. From what we heard from you, perhaps at a later date the committee ought to ask you to come back and tell us what progress you have made on this program.

Dr. FARINHOLT. We would be very happy to do so.

The CHAIRMAN. If there is no further business, the committee stands adjourned.

(Whereupon, at 11:35 a.m., the committee adjourned.)

APPENDIX

[From Science, vol. 127, Apr. 25, 1958]

The Library of Congress

By John Sherrod [1]

Its science collection is one of the finest in the world, with broad reference services for readers.

During the recent Parliament of Science organized by the American Association for the Advancement of Science, the group concerned with communication among scientists and communication of scientific ideas discussed, among other topics, that of libraries and library services. It was somewhat frustrating for me to listen to the participants discuss the science collections of a number of institutions, abstracting services, union catalogs, and other cooperative library projects and not to hear mentioned a truly great science collection which belongs and is accessible, to all of the citizens of this country. In fact, I was dismayed to find in conversations with several of the participants that, almost unanimously, they were either totally unaware of or misinformed about one of the largest collections of science materials in the world and what we at the Library of Congress modestly hope is one of the finest of such collections.

It is my hope that this brief report on the science collections and services of the Library of Congress will be of interest or even possible benefit to readers of this journal. I cannot describe these national resources in a completely detached manner; neither can I assume credit for them, since they originated somewhat before my time. When, in 1815, the Congress purchased from Thomas Jefferson his great book collection, the Library acquired the finest private library in the New World and one assembled with a special eye to "natural philosophy." In the nearly 150 years that have followed, the Library's interest in works of science and technology has never been lost.

COLLECTIONS

The Library of Congress is a research library which exists primarily to serve the Congress and, by that token, to serve the whole Federal Government and thereafter, by means direct and indirect, the whole Nation. These claims upon the Library and their relative priorities are considerations of vital importance to an understanding of its policies and practices as they relate to its collection and servicing of its science holdings.

The first great external stimulus to the collection of science literature by the Library came in 1866 when, by act of Congress, the Smithsonian Institution's "complete collection of the memoirs and transactions of learned societies throughout the world and an entire series of the most important scientific and literary periodicals" were transferred to the Library of Congress in order that they might be housed and serviced more adequately. The Library of Congress continued and greatly expanded the foreign exchange program begun by the Smithsonian. Today it has a worldwide network of more than 16,000 exchange agreements with foreign governments and private research centers, laboratories, universities, observatories, and other scientific and technical institutions, which brings in nearly half a million books, pamphlets, journals, and other materials annually.

The facilities of U.S. agencies, both here and abroad, are also utilized in adding to the collections. Through the operation of the copyright law, the Library receives all American publications and many foreign ones in the scientific field that are registered for copyright. Other materials are received through the operation of domestic exchange agreements, by transfer, by gift, and by purchase. Some 240 dealers outside this country have standing orders to acquire, for the Library, publications of importance, regardless of language or country of origin.

[1] The author is chief of the Science and Technology Division of the Library of Congress, Washington, D.C.

The size and scope of the Library's present scientific and technological holdings attest to the vigor with which acquisitions in these fields have been pursued. As of June 30, 1957, there were 1,447,000 volumes classified (in the Library sense) in science and technology, or about 25 percent of the Library's total classified collection. It is estimated that the number of journal titles in science and technology received currently in the Library of Congress is approximately 15,000. Its collections in the Russian and Eastern European languages are the most extensive in the world outside the Soviet Union and the Iron Curtain countries, and this superiority applies to science materials as well as to the literature in other fields. A check of the Library's science receipts against the Soviet national bibliography indicates that 60 percent of the Soviet materials currently published in the natural sciences and 41 percent of those published in technology are being obtained by the Library.

The Library's strength in these area-language categories does not argue any weakness in others. Diversified specialization has resulted in great strengths in many fields and facets of science. Preeminence in the literature of aeronautics and of the aeronautical sciences has been enjoyed by the Library for many years. It is also undoubtedly the best equipped library in the United States for geographic and cartographic research and possesses collections totaling 2,500,000 maps and 20,000 atlases. It is well endowed with works of bibliography and has concentrated on collecting and maintaining book and card indexes, abstracting journals, and other finding and analytical aids relating to the literature of science and technology.

As the periodical article was the chosen vehicle for disseminating information in the 19th century, so the technical report has become the medium of today, and the Library has in recent years accumulated many tens of thousands of technical reports from a wide variety of sources and in nearly as great a variety of forms. These reports emanate chiefly from Government or Government-sponsored research, with a high proportion related to military programs. Wherever practicable, reports are acquired in their original printed or near-print form, but many are received on microfilm and microcards and are serviced through the use of viewers or through photoenlargement. Some of the principal segments of this large aggregation of reports include the publications issued by the Atomic Energy Commission and the National Advisory Committee for Aeronautics and the publications distributed by such organizations as the Office of Technical Services of the Department of Commerce.

Through analysis, description, and the dissemination of information about its holdings in science and technology, as well as in other fields, the Library makes its national collections meaningful and available to the Government and the Nation. Its system of subject classification, which is constantly being revised and kept up-to-date, is used by the major research libraries of the country. The Library prints and distributes catalog cards describing not only its own holdings but those of many other libraries. The essential nature of this service is evidenced by the fact that there are nearly 10,000 subscribers to it. The Library also maintains the national union catalog, containing cards locating research materials in 700 North American libraries, and it publishes the "National Union Catalog" and other catalogs in book form. To make information about acquisitions in certain fields, including science and technology, quickly available, the Library publishes the following monthly accessions lists: New Serial Titles, listing the periodicals received by the Library of Congress and some 200 other cooperating libraries, the Monthly Index of Russian Accessions (MIRA), the East European Accessions Index (EEAI), and the Southern Asia Accessions List. Out of a 1-year accumulation of 11,709 monographs included in the Monthly Index of Russian Accessions, 6,006 were classed as science and technology; of 8,918 periodical issues listed (not including newspapers), 4,800 were in the same fields. In 1 year (1956), the East European Accessions List described 1,522 monographs and 9,946 periodical issues in science and technology.

SCIENCE AND TECHNOLOGY DIVISION

These bibliographic endeavors make a formidable contribution to the Nation's scientific effort, but they do not begin to exhaust the Library's investment in this area. The Library has also facilitated the widest possible exploitation of its resources, within the limits of budget, space, and its primary commitment of service to Congress. In addition to its own special divisions to provide reference and bibliographic services, the Library has since World War II administered several large-scale projects on funds transferred from the Department

of Defense to provide analytical, abstracting, and bilbiographic services on scientific and technical literature, including report literature, as well as other materials in the Library that need to be intensively utilized in undertakings important to the security of the United States and the free world.

The focal point of subject competence within the Library in all fields of science and technology is the Science and Technology Division, which has primary responsibility for reference and bibliographical services and for advising on the acquisition of all pertinent scientific and technological materials. Established in 1949 with a small staff to plan and develop a science program, the Division has assumed an increasingly active role in meeting the Library's growing obligations to provide its users with scientific information.

The primary function of the Division is to provide general and advanced science reference service. The recent upsurge in interest in science is reflected in the growth of the reference service provided by the Division: this growth has been approximately 400 percent in the last year.

Science reference service to readers is provided in the science reading room, which is operated on a 7-day-a-week basis by staff members who are particularly familiar with the collections. Inquiries of a general nature received by telephone or mail are also handled here. Inquiries of a more advanced nature are handled by staff members who have had specialized training in the various fields of science.

An open catalog to the extensive report collection referred to above is maintained in the division. Supplemental support is provided by the National Science Foundation to expand the report collections and the personal reference services offered with respect to them. The Foundation also supports an exploratory program in the oriental science literature, particularly Japanese literature. It can be hoped that such a study will result in the publication of critical bibliographies of this literature. An expanded program of a similar nature is also contemplated in Slavic science literature.

The primary responsibility of the division in the field of bibliography is to assure the effective use of the scientific and technical literature in the Library. Current activities include the preparation of a bibliography on the International Geophysical Year, a world list of aeronautical serial publications, and a list of scientific and technical serials currently received by the Library. Several continuing bibliographies are also being prepared for agencies within the Department of Defense. An example of such a bibliography is one being prepared for the Snow Ice and Permafrost Research Establishment of the U.S. Army Corps of Engineers. This bibliography, in progress since 1951, has brought under bibliographical control essentially all of the world's technical literature on the subjects of snow, ice, frozen ground, and related military and engineering topics. To date, more than 16,000 abstracts have been published in 12 volumes. These abstracts cover material published since the 18th century in 24 different languages.

The basic purpose of the Division's acquisitions activities is to maintain and further develop the collections of the Library in science and technology. The major effort in this area is expended in keeping current in serial publications and selecting for the collections from the 200 or so that appear each month for the first time. Although recommendations are made on a selective basis, pointed effort is made to develop a sample file of those serials of minimal importance which, for one reason or another, are not recommended for continued acquisition.

The Division, as an information center, is constantly studying the application of improved and advanced documentation techniques in order better to cope with the increasing volume of published literature. The Division desires to maintain active contact with research groups and other organizations in order to be informed concerning their interests and activities and the substantive output of research as it affects the literature. The Division, in turn, publicizes its own activities, programs, and services, and, as far as possible, makes these available to the public.

The Library of Congress serves in many ways as the national library of the United States. This brief examination of its resources, its services, and its plans in the field of science and technology should serve to demonstrate that, by the broadness of its base, the preeminence of its collections in many disciplines, its long record as an authority in bibliographic know-how, and the rich competence

and variety of its staff, the Library of Congress is also the national library of science.

It can be seen that the Library of Congress has a vast investment in the literature of science. It must follow that science, which in great measure relies for its own stimulation and growth on that literature, has an equally large investment in the Library of Congress.

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American Use of Soviet Medical Research

(By Saul Herner [1])

A study of 500 medical scientists shows that they make comparatively little use of Soviet work.

During the past several years there has been a growing interest in the United States in Soviet scientific research. This interest has arisen in part from the political concern of the United States in the overall activities of the Soviet Union and in part from a growing awareness of an acceleration of activity in science and technology in the Soviet Union since World War II.

One outgrowth of the increased interest in Soviet science has been a program organized by the National Institutes of Health to make Soviet medical research information more readily available to American medical scientists. This program was instituted at the request of the Committee on Appropriations of the U.S. Senate. It grew out of testimony at the 1956 appropriations hearings of the Department of Health, Education, and Welfare, during which it was observed that Soviet medical scientists are keenly aware of American developments in medicine but that American medical scientists know very little about Soviet medical research activity. The presumed advantage that Soviet medical scientists have over the American scientists is twofold. First, the Soviet scientists benefit from a broad and intensive foreign-information-gathering and translation program in the Soviet Union which covers practically every area of science and practically every nation's literature; second, where American medical research information is concerned, the average Soviet scientist has the advantage of having a fair working knowledge of the English language.

This article (1) is an account of the findings of an interview study which was performed at the request of the National Institutes of Health to define the extent and character of the need for Soviet medical research information among American medical scientists and to evolve the best means of meeting this need. The study was also designed to analyze the present mechanisms of use of Soviet medical research information among American medical scientists. In cases where Soviet research information was not being used, it was also the purpose of the study to ascertain and evaluate the reasons for the lack of use. Among the questions considered in ascertaining the reasons for any established lack of use of Soviet information were those of the respondents' familiarity with Soviet work in their fields of science and their general attitudes toward the Soviet Union and Soviet science.

Derivation and Character of the Sample

The sample for the study consisted of 500 American medical scientists. These scientists were drawn from 59 medical research organizations in 6 American cities. The organizations represented hospitals, medical schools, Government agencies, pharmaceutical firms, and independent research institutions. The cities in which organizations were chosen for study were New York, Philadelphia, Baltimore, Washington, Chicago, and Cleveland. These cities were chosen because they represented a concentration of medical research activity. The 500 scientists interviewed represented all of the major fields of medical research. The median age of the respondents was 36. Forty-five percent had M.D. degrees; 45 percent had Ph. D. or D. Sc. degrees; and the remaining 10 percent had various other scientific degrees.

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TABLE 1.—*Respondents' use of, and ability to read, foreign-language literature*

Foreign language	Respondent			
	Encounters most often (percent)	Can read (percent)	Has read in past 6 months (percent)	Has read abstract in past 6 months (percent)
German	89	87	62	26
French	71	87	60	21
Spanish	18	28	12	5
Italian	15	28	13	2
Russian	5	6	3	0
Scandinavian	4	7	3	1
Japanese	3	1	1	0
Dutch	2	5	2	0
Other	4	13	4	3
None	4	4	20	63

The specific organizations from which the respondents were drawn were selected from such reference works as the National Research Council's "Industrial Research Laboratories in the United States and Canada," the American Council on Education's "American Colleges and Universities," and the National Science Foundation's "Grants and Contracts for Unclassified Research in the Life Sciences." The selection of organizations for study was intentionally skewed so that places most likely to have facilities for obtaining and utilizing Soviet information would dominate the sample. This was done to alleviate an anticipated (and subsequently justified) fear that if the sample were completely random it would contain so few respondents having experience with Soviet medical research information as to limit severely the implications and significance of the study.

REPRESENTATIVENESS AND STATISTICAL DEPENDABILITY OF THE SAMPLE

In view of the intentional bias in the selection of organizations for study, it is obvious that the sample cannot be considered representative of all medical research activities in the United States. The conclusions and implications drawn from the study are valid only for the specific organizations in the sample.

Statistically, with the limitations noted, the sample of respondents drawn is of an adequate size to insure a fairly high degree of quantitative dependability. With a sample of 500, the maximum sampling error is in the vicinity of 4 percent. Furthermore, as a result of the method of sampling, in which the number of respondents chosen in each organization was a function of its proportionate size and in which the individual respondents were selected randomly, there is reasonable assurance that the sample constitutes a proportionately representative profile of the limited universe.

INTERVIEWING

The interviews were conducted by a staff of trained interviewers, all of whom were experienced in face-to-face interviewing techniques. To supplement their past experience and training, each of the interviewers was carefully oriented as to the nature and purposes of the study. This training was done by means of lectures and demonstrations, mock interviews, and trial interviews.

Draft schedules were prepared and pretested on medical research personnel in organizations outside the sample orbit. At the end of the pretesting, indicated editorial changes were made in the draft schedules, and the final schedules were drawn up.

While the majority of the questions in the schedule were of the precoded or checkoff type, they were kept sufficiently open-ended to permit answers other than those anticipated. The interviewers were instructed to record verbatim all information volunteered by respondents in answer to questions. In the case of discussion questions, the interviewers probed to obtain the most detailed answers possible. The average interview consumed approximately an hour and a quarter.

LINGUISTIC ABILITY AND USE OF FOREIGN-LANGUAGE LITERATURE

For purposes of obtaining background information against which the relative use of Soviet information might be measured, each of the respondents was asked a series of questions about the foreign languages he encountered most frequently

in his professional reading, his linguistic abilities, and his actual use of foreign-language publications in the previous 6 months.

As might have been expected, German and French were by far the most frequently encountered foreign languages. After German and French came Spanish and Italian. Next came Russian and Scandinavian, followed by Dutch.

In order to develop data on linguistic abilities, each of the respondents was asked to list all languages that he could read with reasonable facility. For the purposes of the present study, being able to read a language with "reasonable facility" was defined as being able to get through a scientific or technical paper in that language with the aid of a dictionary. As in the case of foreign languages encountered, German and French stood out as the foreign languages in which the greatest proportion of the respondents had reading ability. Following German and French were Italian and Spanish. Next came Scandinavian languages, Russian, Dutch, and Japanese (see table 1).

Further detail on the use made of foreign-language literature was obtained by asking each of the respondents whether he had read any technical literature in foreign languages in the previous 6 months and, if so, in what languages. The answers paralleled those obtained from the previous two questions. Sixty-three percent of the respondents had read technical literature in German in the previous 6 months; 60 percent had read literature in French; 13 percent in Italian; 12 percent in Spanish; 3 percent in Russian; 3 percent in Scandinavian languages; and 2 percent in Dutch. Twenty percent of the respondents had not read any technical publications in a foreign language during the previous 6 months.

DEGREE OF USE OF SOVIET INFORMATION

In order to establish a dependable basis for defining the type and extent of use of Soviet information by the respondent group, each respondent was prescreened by means of a question which asked whether or not he had sought or obtained any information on Soviet research in his field during the previous 6 months. Those respondents who answered the question affirmatively were asked a series of detailed questions which they were to answer on the basis of their actual recent experience with respect to Soviet information. Those respondents who had not sought or made use of Soviet information in the previous 6 months were asked another set of questions, designed to establish the reasons for this lack of use.

As it turned out, slighly less than half of the respondents had sought or made use of Soviet information in the previous 6 months. The majority of the preclinical scientists had sought or obtained Soviet information in the previous 6 months, and the majority of the clinical scientists had not.

METHODS OF OBTAINING SOVIET INFORMATION

The first question that was put to the respondents who had sought or obtained Soviet information was where they had obtained it (if they had succeeded in obtaining it). As it developed, these respondents used a variety of tools and methods in getting it.

The primary means was through the indexing and abstracting publications. The second most general method of obtaining Soviet research information was through English-language papers, including review papers, in which Soviet developments were discussed. The third most important source of Soviet information was the translated paper or book. The fourth most frequently cited means of obtaining Soviet information was through reports from recent visitors to the Soviet Union or through personal conversations with such persons. Fifth in importance were papers in the Russian language and abstracts and proceedings of meetings. Then came translated editions of Soviet journals and attendance at international meetings, followed by conversations with visitors from the Soviet Union.

As a means of evaluating the usefulness of the various methods and tools for obtaining access to Soviet information, each of the respondents who had had experience with such information in the previous 6 months was asked what method or tool he considered most valuable in obtaining it. The overwhelming answer was, indexing and abstracting publications.

WAYS TO LEARN OF SOVIET INFORMATION

In order to determine whether medical scientists use different methods to apprise themselves of Soviet information from those they use to get information from other countries, each of the 500 respondents was asked how he became aware

of the existence of scientific information in general, of foreign-language information in general, and of Soviet information. As it developed, there were significant differences.

In the case of scientific information in general, the average respondent used 7.6 different tools or methods for learning of the existence of useful information; for foreign-language information, the average number of tools or methods was 4.4; for Soviet information, this number was 1.6.

In all three cases, the most prominent tools or methods were indexing and abstracting publications, footnotes or cited references, personal recommendations, and personal reference files. However, there is an interesting shift in the relative importance of these tools or techniques as one goes from information in general, to foreign-language information in general, to Russian information (table 2).

When asked how they became aware of information in general, the respondents placed cited references and indexing and abstracting publications on an approximately equal level of importance, with personal recommendations and personal reference files slightly behind. In the case of foreign-language information in general, the significance of cited references diminished slightly and the significance of indexing and abstracting publications rose. Where only Soviet information was concerned, the significance of indexing and abstracting publications rose to nearly twice that of cited references. Personal recommendations also rose in importance.

The element of chance or accident was relatively great for all three types of information. However, there is a definite diminution in the role of chance or accident as one goes from information in general, to foreign-language information in general, to Soviet information. This pattern would seem to relate to the falling off in the number of bibliographic tools used by the respondents in their efforts to learn of Soviet and other foreign-language information, as opposed to information in general.

INDEXING AND ABSTRACTING PUBLICATIONS

In all, 40 different indexing and abstracting publications were mentioned by the respondents as having been used for locating or learning of Soviet information. The one most frequently mentioned was "Chemical Abstracts." This was followed, in order of rank, by "Biological Abstracts," "Current List of Medical Literature," "Chemisches Zentralblatt," "Excerpta Medica," "Translation Monthly," "Library of Congress Bibliography of Translations from Russian Scientific and Technical Literature (2)," "Library of Congress Monthly List of Russian Accessions," "Psychological Abstracts," "Quarterly Cumulative Index Medicus," "Leukemia Abstracts," and the Consultants Bureau's list of available Soviet translations. It is interesting to note, in further confirmation of the narrowing of the variety of bibliographic tools and techniques used in specialized literature, that the use made of the first five indexing and abstracting publications named was greater than that made of the remaining 35 combined.

TABLE 2.—*Tools or methods for locating, or becoming aware of sources of, information about Soviet medical research, used in the past 6 months*

[Percent]

Tools or methods	For information in general	For foreign information	For Soviet information
Footnotes or other cited references	97.0	79.0	29.0
By chance or accident, while looking through publications	96.0	70.0	31.0
Indexing and abstracting publications	95.0	86.0	53.0
Personal recommendations	88.0	61.0	25.0
Personal reference files	81.0	49.0	10.0
Book reviews	70.0	26.0	4.0
Library card catalogs	69.0	17.0	2.0
Publishers' advertisements	67.0	16.0	1.0
Library acquisition lists	59.0	21.0	4.0
Separate bibliographies	42.0	16.0	5.0
Other	2.0	2.0	13.0
Average number of methods used	7.6	4.4	1.6

SOVIET JOURNALS

Another measure of the use that is made of Soviet literature and Soviet information is the degree to which the respondents endeavor to see Soviet journals on a frequent or regular basis. In order to develop data on this point, each of the respondents who had sought or made use of Soviet information during the previous 6 months was asked whether there were any specific Soviet journals that he saw either regularly or occasionally.

Of the 240 respondents who had sought or obtained Soviet information in the previous 6 months, 58 did see specific Soviet journals on a regular or occasional basis. The median number of journals named by the respondents was one, although several named as many as five. Eight of the respondents who saw Soviet journals with some frequency saw them in translated form.

In all, 15 Soviet journal titles were named by the respondents who did see Soviet journals. These titles, in order of rank, by number of times mentioned (figures in parentheses), are as follows: "Biokhimiya" (16), "Zhurnal Obshchei Khimii" (10), "Doklady Akademii Nauk S.S.S.R." (8), Byulleten Eksperimental'noi Biologii i Meditsiny" (7), "Fiziologicheskii Zhurnal S.S.S.R. imeni I. M. Sechenova" (4), "Mikrobiologiya" (3), "Biofizika" (2), "Meditsinskaya Parazitologiya i Parazitarnye Bolezni" (1) "Sovetskaya Meditsina" (1), "Terapevticheskii Arkhiv" (1), "Voprosy Virusologii" (1), "Zhurnal Analiticheskoi Khimii" (1), "Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii" (1), "Zhurnal Nevropatologii i Psikhiatrii imeni S. S. Korsakova" (1), and "Zhurnal Priklad'noi Khimii" (1).

As still another means of establishing the use made of Soviet publications, each of the respondents who had had experience with Soviet information in the previous 6 months was asked whether he had had any Soviet material translated during this period. Forty-four had, 184 had not, and 12 did not answer. The bulk of the translated items were papers from Soviet journals. For the most part, the translations were made within the respondents' own organizations, either formally, when staff translators were available, or informally, by colleagues, staff members, and similar personnel.

EVALUATIONS OF SOVIET JOURNALS

In answer to a followup question on how the Soviet journals compared with their American counterparts, none of the respondents who saw Soviet journals on a regular or occasional basis thought them superior; 18 thought them equal to their American counterparts; 25 thought the Soviet journals inferior; and 15 did not express an opinion. Along with the value judgments as to the relative merits of Soviet journals, a record was kept of the verbatim remarks of the respondents on the subject.

TABLE 3.—*Respondents' opinions of current Soviet medical research*

Evaluations	Respondents		Both groups (percent)
	Had sought or obtained Soviet information in past 6 months (percent)	Had not sought or obtained Soviet information in past 6 months (percent)	
Don't know, or no opinion	30	60	46
Good, or adequate, or equal to United States	33	13	23
Of inferior or questionable quality	30	23	26
Varies from good to bad	8	3	6

The remarks took many different forms and covered many areas. However, they can be distilled down to the following points: In overall quality, the Soviet journals seen by the respondents vary, like all journals, from good to bad. But, in general, they are inferior in quality to comparable American journals. The papers are often uninteresting, they leave out important details, and they are

poorly documented. The theories expounded in the papers are not modern, although an occasional novel idea seeps through. There is an overemphasis on applied science, to the detriment of coverage of basic science. The papers do not appear to be politically slanted.

REASONS FOR NOT USING SOVIET INFORMATION

To turn now to the question of why over half of the respondents had not sought or obtained any Soviet research information during the previous 6 months, the primary reasons stated were lack of accessibility and lack of familiarity. First, it was felt that there are no fully adequate keys to make the American scientist aware of the existence of pertinent Soviet information, and that, if there are keys, they are not being sufficiently publicized. Second, the nonusers expressed the feeling that they could not obtain up-to-date Soviet publications. Third, there was the language barrier and the difficulty of obtaining translations when and as they are needed. Fourth, there was the problem of inadequate contact, correspondence, and exchange of information with Soviet scientists on a person-to-person basis. This was related, in the minds of a number of the respondents, to security restrictions imposed by both the United States and Soviet Governments. Fifth, and related to the fourth problem, was a lack of familiarity with notable Soviet workers in fields of interest to the respondents. Sixth, there was an ignorance of what the Soviet Union is doing in pertinent fields and of whether it is worth looking into.

In addition to the problems of inaccessibility and unfamiliarity, there was a proportion of the respondents who did not believe that the Soviet medical scientists were doing work in subjects of immediate interest to them. Coupled with this was the feeling of many of the respondents that the Soviet work in their fields was on a low technical level and unreliable. Finally, there was the overriding problem of inertia: A large percentage of the respondents who had not sought or obtained Soviet information in the previous 6 months, when asked whether there was any particular reason for this, answered that they simply felt no specific need for Soviet information, that they were not in the habit of looking for it or using it, or that they did not have time to look for it. Related to these attitudes is the remark of a number of the respondents to the effect that, in seeking information, they did not single out any countries in particular but were interested in pertinent work wherever it was being done.

ACCESSIBILITY OF SOVIET INFORMATION

In order to probe a bit deeper into the overall problem of accessibility, each of the respondents was asked specifically whether he considered Soviet information in his field to be readily available to him. In cases where the respondent answered "No," he was asked to describe any particular problem that he had encountered in obtaining Soviet information. In answer to the first question, 6 percent of the respondents considered Soviet information readily available to them; 76 percent did not consider it readily available; and 18 percent did not know. Of the respondents who did not consider Soviet information readily available, 54 percent had never tried to obtain it. This merely reemphasizes the fact that the small use that is made of Soviet information by American medical scientists is due, in large measure, to a simple lack of interest in it. In all other respects, the problems described as posing barriers to obtaining Soviet information were exactly the same as those described in answer to the question about why the respondent had not sought or used Soviet information in the previous 6 months.

INCREASING AVAILABILITY OF SOVIET INFORMATION

As a logical extension of the discussion of the availability of Soviet information, all of the respondents were queried about possible means of increasing its accessibility. The suggestions advanced fell into four general categories. The most widely recommended method for increasing the availability of Soviet information was by improving the coverage of Soviet literature by indexing and abstracting publications. This would seem to follow logically on the heavy reliance that is already placed on indexing and abstracting publications as a means of obtaining and learning of the existence of Soviet and other foreign-language information.

A number of the respondents (considerably fewer than those who wanted broader coverage in abstracting publications) suggested the dissemination of translated tables of contents of current Soviet medical periodicals. Actually, the Russians have made a start in this direction themselves by resuming the practice

of including English-language summaries and tables of contents in their major medical science journals.

The second category of recommendations dealt with translations. There was fairly general agreement that some sort of translation service is needed to make Soviet information more readily and more cheaply available. There were a number of opinions about just what should be translated and how the needed translation program should be conducted. The largest segment of the recommendations was for facilities for having translations made on request, with the individual scientist ordering translations of specific items as he needs them. Then there was a group that suggested cover-to-cover translations of selected Soviet journals. A somewhat smaller group wanted translations of selected articles.

The third category of recommendations called for the fostering of more direct contact between the American scientist and the Soviet scientist through such devices as meetings in which American and Soviet scientists participate, the promoting and encouraging of exchange visits by American scientists to the Soviet Union and by Soviet scientists to the United States, and correspondence with Soviet scientists. A number of respondents emphasized the need for allaying the fears of many American scientists that keep them from making contact with Soviet scientists.

A fourth and final category of suggestions had to do with making the Soviet publications themselves more accessible. A number of respondents were concerned with the fact that, once they become better acquainted with Soviet work in their fields, through abstracts, cited references, and other means, they would develop a growing need for the literature cited or abstracted. They anticipated the frustrations which might arise from knowing of the existence of possibly useful material and being unable to get hold of it. A number of respondents expressed the opinion that, in many cases, abstracts or translations would not be sufficient, and that the original publications would be necessary. In order that these publications might be made available as needed, these respondents suggested establishing some sort of centralized or regional facility for distributing reprints and photostats of Soviet publications on request.

EVALUATION OF SOVIET MEDICAL SCIENCE

Eventually, whatever is done to improve the availability of information on Soviet science must be related to its quality. Obviously, if the quality of Soviet science is high in the eyes of American scientists, there is an inducement to obtain and make available more information about it. On the other hand, if the assessed quality of Soviet science is low, there would seem to be less point in undertaking any special efforts to make information about it available.

The respondents' opinions of the quality of Soviet journals have already been discussed. In addition to the matter of the quality of Soviet journals, each of the respondents was queried about his opinion of the quality of Soviet research in his field. For purposes of comparison, the answers obtained from those respondents who had made use of Soviet research information in the previous 6 months were separated from the answers of those who had not.

In general, the respondents' opinions of Soviet research were fairly evenly divided between "good" and "bad." Forty-six percent did not venture an opinion; 23 percent categorized it as either good, adequate, or on a par with American medical science; 26 percent considered it inferior or of questionable quality; and 6 percent thought the quality varied from good to bad (table 3).

There was an interesting contrast between the opinions of the respondents who had sought or obtained Soviet information in the previous 6 months and those who had not. Among the respondents who had had some recent experience with information on Soviet science, 30 percent had no particular opinion about its quality; 33 percent were favorably impressed by it; 30 percent considered it inferior or of questionable quality; and 8 percent thought its quality varied from good to bad. Among those respondents who had not sought or obtained Soviet information in the previous 6 months, the opinions were reversed: 60 percent had no opinion; 13 percent considered Soviet science to be good, adequate, or comparable to our own; 23 percent considered it inferior; and 3 percent considered it variable.

CRITICISM OF SOVIET MEDICAL SCIENCE

As is frequently the case, those respondents who were critical of Soviet science had much more to say to justify their opinions than did those who were favorably inclined toward it. The primary criticism advanced by those respondents who were not favorably disposed toward Soviet science was that it is not trustworthy.

The second most often expressed criticism was that the work of Soviet scientists is behind the times. Another fairly large group considered Soviet science to be politically biased (seemingly contradicting the group which considered Soviet research journals not to be politically biased—a group that was considerably smaller than the present one). Another comment, which was also made in connection with Soviet research journals, was that the Russians tend to overemphasize applications and are not interested enough in basic research.

In addition to the clearly critical comments, a number of the respondents stated that their lack of interest in Soviet science stemmed from the fact that the Russians and Americans work in different fields. This comment may serve to explain the earlier comment, made by a number of respondents, that the Russians are good in "other" fields. It could also explain the general apathy of the respondents toward Soviet science, although distrust and ignorance are also factors.

The gist of the favorable comments was that Soviet medical science is improving; that the Soviets used to do good work, and that this is an indication that they are capable of it; that they do good work in other fields (other than that in which the respondent is working); that they do good work in fields connected with warfare; that their scientific facilities are equal to ours; and that their freedom and lack of moral restriction in their conduct of experiments are a help to them. In addition to the foregoing comments, which encompass the views of the largest segment of the respondent group, a fair number of respondents used such adjectives as "highly imaginative," "unique," "uninhibited," and "fantastic" in their evaluations of Soviet science. It is difficult to say whether the last adjective is actually an accolade or a condemnation.

KNOWLEDGE ABOUT SOVIET WORKERS

Another measure of the value placed on Soviet science by the respondents is their interest in the activities of specific workers in the Soviet Union. In answer to a question on the subject, 94 of the respondents named specific Soviet scientists whose writings they said they would like to see translated into English. They named a total of 96 different Soviet scientists. The average number named was two. There was an interesting repetition in the names mentioned, indicating independent agreement about the apparent importance of the Soviet scientists involved. One scientist, Braunstein, was named 15 times; another, Englehardt, was named 14 times; and a third, Smorodinzev, was mentioned 12 times. In a few cases, in naming Soviet scientists, it developed that the respondents were thinking of scientists they used to follow. While every effort has been made to correct for this in the tally, it is probable that a small percentage of the scientists named and counted are no longer living.

The 10 scientists named most frequently were the following: Braunstein (biochemistry, enzymology), Englehardt (biochemistry), Smorodinzev (virology), Kritzman (biochemistry), Orbeli (physiology), Bykov (physiology), Beritoff (physiology), Palladin (biochemistry), Oparin (biochemistry), and Schumakov (virology, bacteriology). Actually, the fields covered by the Soviet scientists named practically run the gamut of preclinical and clinical medical science. In addition to the fields already mentioned, these included the following: biostatistics, cardiology, dentistry, dermatology, embryology, epidemiology, genetics, hematology, medicine, neurology, ophthalmology, pathology, pediatrics, pharmacology and therapeutics, psychiatry, radiology, and surgery. From the foregoing data, it is clear that the Soviet Union, like most other countries, has its "name" scientists, who are known and respected by their counterparts in the United States. There also is apparently good agreement about who these "name" scientists are.

RATINGS OF SOVIET WITH OTHER FOREIGN RESEARCH

One other means used in the present study to elicit value judgments of the quality of Soviet medical research was to ask the respondents whether there were any other foreign-language countries whose research activities they would like to know more about, and to have them rate these other countries against the Soviet Union. This line of questioning produced a list of 28 countries. The countries named most frequently were Germany, Japan, France, Czechoslovakia, Italy, Sweden, Hungary, China, Poland, and Switzerland, in that order. Of these countries, Germany, Japan, France, Italy, Sweden, and Switzerland were generally rated above the Soviet Union, and Czechoslovakia, Hungary, China, and Poland were generally rated below.

TABLE 4.—*Respondents rating of Soviet medical research against medical research in other foreign-language countries*

Country	Number of times cited	Number of times ranked above U.S.S.R.	Number of times ranked below U.S.S.R.	Number of times ranked equal to U.S.S.R.	Number of times comparison with U.S.S.R. was not possible
Germany	106	53	10	1	42
Japan	90	33	26	4	27
France	60	23	4	1	32
Czechoslovakia	44	5	21	0	18
Italy	44	10	6	0	28
Sweden	37	14	1	0	22
Hungary	36	4	14	1	17
China	28	3	13	0	12
Poland	21	1	12	1	7
Switzerland	21	7	0	0	14
Argentina	20	5	5	0	10
Brazil	12	2	3	0	7
Denmark	10	6	1	0	3
Holland	10	5	1	0	4
India	10	1	4	0	5
Finland	9	0	3	0	6
Yugoslavia	8	1	6	0	1
Spain	7	1	0	0	6
Mexico	6	2	1	0	3
Austria	5	1	1	0	3
Israel	4	0	1	0	3
Norway	4	0	0	0	4
Belgium	3	1	0	0	2
Chile	3	0	2	0	1
South Africa	3	1	0	0	2
Portugal	2	0	0	0	2
Rumania	2	0	2	0	0
Cuba	1	1	0	0	0
Total	606	180	137	8	281

On examining the list of countries cited (table 4), it is clear that one of the greatest stimulants to the use of information is familiarity with its source. This is demonstrated by the expression of the need for more information from countries such as France and Germany, whose information is already abundantly available and heavily used. This expression of need may, of course, be related to the form in which American medical scientists prefer to get their German and French information; it may merely mean that they are not getting enough information on German and French research activities in the English-language articles and abstracts from which they ordinarily expect to obtain it.

To return to the question of how the respondents rated the countries they named in comparison with the Soviet Union, the fact that emerges most clearly is that the Soviet Union is an enigma to the American scientist; he cannot say with certainty how he would rate the Soviet Union against countries whose work he is familiar with. In the comparative ratings, there were 180 cases in which countries were rated above the Soviet Union, 137 cases in which countries were rated below the Soviet Union, 8 cases in which the Soviet Union was rated equal to the countries mentioned, and 281 "don't know's." If the thesis that familiarity with a country's work stimulates interest in it is a correct one, the present lack of familiarity with the Soviet Union is likely to be self-perpetuating, unless some sort of artificial stimulus is utilized to alter the situation.

CONCLUSIONS AND IMPLICATIONS

From the foregoing discussion, it is evident that lack of accessibility and a resulting lack of familiarity overshadow and limit the respondent's use of Soviet medical research information. The choices of methods for learning about pertinent Soviet activity are severely limited. The importance of indexing and abstracting publications in the case of Soviet information is heightened, and the importance of such prominent tools as cited references in the English-language literature is diminished. Authors apparently do not refer as much to Soviet publications as they do to those of other foreign-language countries. The reluctance or inability of authors to give greater attention to Soviet developments in their discussions

and references has had a limiting effect on the methods available to the respondents for keeping abreast of Soviet work in their fields.

Another factor which has a limiting effect upon the respondents' use of Soviet information is their apparent unwillingness to read foreign-language literature. From the answers to questions about the respondents' ability to read foreign languages and their actual use of such literature, it is evident that linguistic ability alone does not insure the use of foreign-language literature. However, this conclusion should be tempered by the understanding that reading in a language other than one's mother tongue is bound to be comparatively slow and difficult, and is bound to be avoided or at least infrequently practiced because of sheer lack of time. This factor would undoubtedly limit the use of Soviet literature, even if it should become universally available and even if a large percentage of American scientists develop a reading knowledge of Russian.

It is possible that the present Soviet practice of including English summaries and tables of contents in Soviet medical journals will alter the situation somewhat by easing the language problem and ultimately making pertinent work in the Soviet Union more familiar to the American medical scientist. Perhaps this will be a means of curbing the distrust and lack of interest which presently characterize the American medical scientist's attitude toward Soviet research. A number of the respondents mentioned having read Soviet journals in the past when these included English summaries. Perhaps this activity will now be resumed, provided that pertinent Soviet journals are made available to would-be users.

On the other hand, increased accessibility of the information contained in Soviet journals could have exactly the opposite effect, by exposing current Soviet research to a degree of criticism which has not been possible in the past. It is possible that the availability of Soviet journals in a form which permits perusal will serve to amplify the critical attitudes of American scientists toward Soviet medical science. In a significant number of cases in the present study, respondents mentioned having been unable to duplicate experiments and results reported in Soviet journals. Such experiences are bound to color a scientist's attitude toward Soviet research and his interest in Soviet information even if the information is readily available.

But distrust or skepticism are not the only factors that may militate against the use of Soviet medical research information. The basic problem that makes it difficult to induce medical scientists in this country to make more use of Soviet research than they do is that they think in terms of subjects, not countries. When a biochemist wants to know what is being done in a given field of interest to him, he wants to know what is being done everywhere, and not in one particular country. Indeed, if he were to concentrate on specific countries, he would run the danger of getting only a part of the picture. One question that the respondents put to the interviewers continually in the present study was, "Why Russia in particular?"

Ultimately, Soviet medical information will have to meet the test of the marketplace and rise or fall on its merits. There is no question but that Soviet medical research information has been less readily available to American medical scientists than has information from other foreign-language countries. The primary benefits that will accrue from the inclusion of English titles and summaries in Soviet journals, and from the various steps that agencies such as the National Institutes of Health are taking to make Soviet medical literature more broadly accessible, will lie in the fact that American medical scientists will be able to accept or reject the results of Soviet research in exactly the same way that they accept or reject the research of scientists in other countries. Whether increased accessibility of Soviet medical information will give rise to a greater appreciation of Soviet research will depend ultimately upon the quality and nature of that research.

NOTES

(1) I wish to express my indebtedness to Robert S. Meyer for his very significant contribution to the execution of the study on which this article is based.

(2) Publication of the Library of Congress Bibliography of Translations from Scientific and Technical Literature was discontinued in December 1956.

[From the National Science Foundation Scientific Manpower Bulletin, Washington, D.C., October 1958]

Foreign Language Knowledge of American Scientists, 1954–55

Over 97,000 scientists in the National Register of Scientific and Technical Personnel in 1954–55 reported a knowledge, with varying degrees of proficiency, of at least one foreign language. This constitutes over three-quarters of the 127,000 persons in the register at that time.[1]

[1] It is estimated that more than one-half of all American scientists were included in the register during this period.

German was the language reported most often and French next, obviously a reflection of educational requirements for scientific training, particularly at the graduate level. By scientific field, those in chemistry and chemical engineering, and in physics and astronomy showed a greater concentration in the Germanic languages, while in psychology and the earth sciences proportionally greater numbers with knowledge of French, Spanish, and other Romance languages were indicated.

Only about 1 in 50 of those reporting a language ability had a knowledge of Russian and less than 1 in 100, of Chinese. In the case of these languages, it appears that such knowledge stems largely from nativity and family background. These findings indicate that nearly all American scientists must depend on translations for knowledge of scientific developments in the Soviet bloc countries.

Scope and purpose of report

The National Science Foundation, in cooperation with professional scientific societies, maintains the National Register of Scientific and Technical Personnel.[2] Scientists are requested by these societies to provide information on a wide range of items, including their professional specializations, extent of education and training, and employment. Among the questions asked is one dealing with proficiency in foreign languages. The data in this report have been tabulated from the responses to this question by scientists included in the register for 1954–55. The growing interest in scientific development in other countries emphasizes the desirability of more knowledge of our foreign language resources in science. Limited as the present data are, the Foundation considers them important in indicating some of the strengths and weaknesses in the foreign-language abilities of American scientists.

Language distribution[3]

Since a large proportion of scientists included in the register have some formal graduate education, it would be expected that a knowledge of foreign languages, particularly German and French, would be reflected in the data tabulated. The Germanic and Romance languages together were reported by over 70 percent of those reporting a foreign-language ability, despite the fact that they were undoubtedly undercounted in tabulating.[4] (See table 1.)

Knowledge of one of the Romance languages was reported by some 46,000 persons, or 47 percent of the total with a language ability. Of these, 34,000 persons were reported with a knowledge of French and 10,000 with Spanish. Some two-thirds of these 46,000 persons reported a major proficiency,[5] the majority of these indicating a reading ability adequate for research. (See table 2.)

The Germanic languages as a group were reported by 44,000 persons, or 45 percent of the total. Almost all of this group, about 43,000 persons, reported German—the single language most often reported. Some 70 percent in the Germanic language group reported a major proficiency, with two-thirds of these showing a reading ability adequate for research.

Only 4 percent of the total reporting a language ability, about 3,800 persons, reported a knowledge of one of the Balto-Slavic languages, which, together with Arabic and Chinese, were given priority in tabulating. Over 2,100 of these persons reported a knowledge of Russian-Byelorussian-Ukrainian; some 800 reported a knowledge of Polish. In the Balto-Slavic group, over three-quarters reported a major proficiency; of these the largest number, or over one-third, reported a native-speaking fluency.

A major implication of these data is that nearly all of our scientists must depend upon translations of material in order to keep abreast of scientific developments in the Soviet bloc countries.

[2] The following professional societies, together with their constituent and associated societies, cooperated with the National Science Foundation in the collection of these data: American Chemical Society, Ameriacn Geological Institute, American Institute of Biological Sciences, American Institute of Physics, American Mathematical Society, American Meteorological Society, American Psychological Association, and the Federation of American Societies for Experimental Biology.

[3] The languages were classified by philological groupings according to the scheme in "Classifications for Surveys of Highly Trained Personnel," by J. F. Wellemeyer, Jr., Howard F. Foncannon, and Shirley Duncan Hudson, published by the American Council of Learned Societies, 1953. See list of languages with their classifications on p. 8 of this Bulletin.

[4] Only one language was coded for each person showing foreign-language ability, thus requiring an order of priority in cases of multilingual ability. In general, priority was given first to the following languages: Russian, otheer Balto-Slavic (Czechoslovak, Lettish, Lithuanian, Polish, Serbo-Croatian, Slovene, Bulgarian, Balto-Slavic, other), Arabic, and Chinese. The language of highest proficiency was next in priority. The adoption of these priorities was based on anticipation of requests for less well-known languages. See "Technical Notes" for further explanation.

[5] See "Technical Notes" for definition of "major proficiency."

The Tibeto-Chinese languages were reported by some 1,200 persons, or only 1 percent of the total reporting language proficiencies. Almost all of these reported a knowledge of Chinese or Japanese. Of the 800 persons showing a major proficiency in these languages, almost two-thirds indicated a native-speaking fluency.

The data suggest that knowledge of German and French among scientists is preponderantly the result of education and training, and that knowledge of Blato-Slavic and Tibeto-Chinese languages stems largely from nativity and family background.

Language competence by field [9]

The largest number of persons in the register reporting a foreign-language competence, by scientific field, was in chemistry and chemical engineering. (See table 3.) However, it should be pointed out that the distribution of those with a knowledge of a foreign language by scientific field roughly parallels the distribution of all persons in the register by field, chemistry and chemical engineering being the largest group. Despite the rough parallel, there are certain differences that may be of some significance.

In fact, 38 percent of those with a foreign language ability reported a first professional competence in chemistry or chemical engineering, while only 34 percent of all scientists on the register were in these fields. A similar relationship existed for those in psychology, 11 percent compared to 9 percent. On the other hand, only 18 percent of those with a foreign language had a first professional competence in the agricultural and biological sciences while 21 percent of all scientists in the register were in these fields.

There were also differences in emphasis among the major fields with respect to foreign languages. As might be expected, those in chemistry and chemical engineering stressed the Germanic languages. Those in physics and astronomy also showed the greatest emphasis on the Germanic group. Psychology and the earth sciences, on the other hand, placed greater stress on the Romance languages (French, Spanish, Italian, etc.).

TECHNICAL NOTES

There are a number of limitations to the data presented in this report which should be borne in mind in any interpretation of them. Primarily, of course, in any set of statistics based on self-evaluation, subjective judgments exist which cannot be measured. Aside from this limitation, however, there are a number of others arising from the method of collection and tabulation that lend certain bias to the data.

Method of collection

Although an individual might have reported knowledge of several foreign languages, only one language was coded and tabulated. The priority system adopted in coding has been explained in footnote 4 to the text. This coding method produced virtually a full count for the Balto-Slavic groups, Arabic, and Chinese. This could not be said for any of the other languages, particularly the Romance and the Germanic languages. To what extent they have been undercounted is not known.

Degree of proficiency

The language item on the 1954–55 register questionnaire used the following typical instruction:

List only the number of the phrases which most closely describe your degree of proficiency in any language of which you have knowledge.

1. Equivalent to native fluency in speaking.
2. Fluent though obviously foreign in speaking.
3. Adequate for general conversation.
4. Read difficult material with the facility of a native.
5. Reading adequate for research.
6. Read average material.
7. Made linguistic studies.
8. Adequate for travel.
9. Limited knowledge.

For purposes of this report, the first six classifications—that is, through "Read average material"—have been arbitrarily grouped as "major proficiency." The category "Made linguistic studies" was not used for this purpose as it appeared that many respondents misinterpreted its meaning. It was intended to cover professional philological work in linguistics, but was not so interpreted in

[9] See "Technical Notes" for definition of "scientific field."

many cases. This category, therefore, together with "Adequate for travel" and "Limited knowledge" have been grouped together as "slight proficiency."

Scientific fields

The questionnaires used in the register in 1954–55 included two items relating to scientific specialty. The first related to professional specialization, and the respondents were asked to report the specialties in which they considered themselves most competent, ranking them by first and second specialty. The second item dealt with professional employment, the respondents being asked to report the specializations in which they were employed. The classifications of the specializations in the language analysis were on the basis of the first professional competence. This would not necessarily mean, therefore, that all of the people shown under a particular field would be employed in that field, although there is high correlation between professional competence and employment specialization.

TABLE 1.—*Foreign language knowledge of scientists, 1954–55*

Language	*Number of scientists reporting*
Total scientists in register	127, 185
No report of language	29, 911
Total reporting languages	97, 274
Germanic	44, 168
Dano-Norwegian	540
Dutch-Flemish-Afrikaans	401
German	42, 707
Swedish	472
Germanic, other	48
Romance	45, 628
French	33, 740
Italian	1, 204
Portuguese	364
Spanish	10, 023
Romance, other	297
Balto-Slavic	3, 843
Czecho-Slovak	455
Polish	808
Russian-Byelorussian-Ukrainian	2, 157
Balto-Slavic, other	423
Iranian	31
Semitic-Hamitic	754
Arabic	276
Hebrew	248
Semitic-Hamitic, other	230
Altaic	698
Hungarian	383
Altaic, other	315
Sanskritic	134
Dravidian	16
Tibeto-Chinese	1, 240
Chinese	652
Japanese	537
Tibeto-Chinese, other	51
Greek	353
All other languages	409

Source: National Register of Scientific and Technical Personnel, National Science Foundation.

TABLE 2.—*Foreign language proficiency of scientists by degree of competence and by field, 1954–55*

Language and scientific field	Total reporting language knowledge	Foreign language		
		Major proficiency	Slight proficiency	No report of proficiency
Total	97,274			
GERMANIC				
All sciences	44,168	31,202	12,904	62
Agricultural and biological sciences	7,524	5,672	1,831	21
Medical sciences	353	244	106	3
Earth sciences	3,118	1,858	1,250	10
Physics and astronomy	5,201	4,213	976	12
Chemistry and chemical engineering	20,706	14,346	6,359	1
Mathematics	2,944	2,248	684	12
Geography	165	120	44	1
Psychology	3,061	1,906	1,155	
All other sciences	1,096	595	499	2
ROMANCE				
All sciences	45,628	30,080	15,475	73
Agricultural and biological sciences	8,554	6,125	2,412	17
Medical sciences	308	220	85	3
Earth sciences	6,744	3,754	2,973	17
Physics and astronomy	4,234	3,395	830	9
Chemistry and chemical engineering	13,562	8,566	4,990	6
Mathematics	4,054	3,112	924	18
Geography	342	271	71	
Psychology	6,559	3,987	2,572	
All other sciences	1,271	650	618	3
BALTO-SLAVIC				
All sciences	3,843	2,929	909	5
Agricultural and biological sciences	537	395	139	3
Medical sciences	22	19	3	
Earth sciences	385	235	149	1
Physics and astronomy	516	391	124	1
Chemistry and chemical engineering	1,499	1,193	306	
Mathematics	438	365	73	
Geography	34	24	10	
Psychology	275	209	66	
All other sciences	137	98	39	
TIBETO-CHINESE				
All sciences	1,240	816	420	4
Agricultural and biological sciences	250	164	85	1
Medical sciences	8	6	2	
Earth sciences	235	84	151	
Physics and astronomy	156	123	31	2
Chemistry and chemical engineering	331	251	80	
Mathematics	104	83	21	
Geography	26	16	10	
Psychology	85	55	29	1
All other sciences	45	34	11	
ALL OTHER LANGUAGES				
All sciences	2,395	1,928	460	7
Agricultural and biological sciences	476	370	102	4
Medical sciences	15	12	3	
Earth sciences	310	170	138	2
Physics and astronomy	221	199	22	
Chemistry and chemical engineering	728	625	103	
Mathematics	179	165	13	1
Geography	16	9	7	
Psychology	371	311	60	
All other sciences	79	67	12	

Source: National Register of Scientific and Technical Personnel, National Science Foundation.

TABLE 3.—*Foreign language knowledge of scientists, by scientific field and language group, 1954–55*

	Total scientists in register		Total scientists with foreign language knowledge		Foreign languages				
	Number	Percent	Number	Percent	Germanic	Romance	Balto-Slavic	Tibeto-Chinese	Other
All sciences	127,185	100.0	97,274	100.0	44,168	45,628	3,843	1,240	2,395
Agricultural and biological sciences	26,142	20.6	17,341	17.8	7,524	8,554	537	250	476
Medical sciences	949	.7	706	.7	353	308	22	8	15
Earth sciences	17,566	13.8	10,792	11.1	3,118	6,744	385	235	310
Physics and astronomy	13,864	11.0	10,328	10.6	5,201	4,234	516	156	221
Chemistry and chemical engineering	42,546	33.4	36,826	37.9	20,706	13,562	1,499	331	728
Mathematics	9,193	7.2	7,719	7.9	2,944	4,054	438	104	179
Geography	690	.5	583	.6	165	342	34	26	16
Psychology	12,100	9.5	10,351	10.6	3,061	6,559	275	85	371
Other sciences	4,135	3.3	2,628	2.8	1,096	1,271	137	45	79

Source: "National Register of Scientific and Technical Personnel," National Science Foundation.

LIST OF LANGUAGES USED IN CODING "NATIONAL REGISTER OF SCIENTIFIC AND TECHNICAL PERSONNEL, 1954–55"

GERMANIC

Dano-Norwegian
Dutch-Flemish-Afrikaans
German
Icelandic
Swedish
Germanic, other

ROMANCE

French
Italian
Portuguese
Romanian
Spanish
Romance, other

BALTO-SLAVIC

Czechoslovak
Lettish
Lithuanian
Polish
Russian-Byelorussian-Ukrainian
Serbo-Croatian
Slovene
Bulgarian
Balto-Slavic, other

IRANIAN

Balochi
Kurdish
Persian
Pushtu
Tajik
Iranian, other

SEMITIC-HAMITIC

Amharic
Arabic-Syrian-Lebanese-Iraqi-Maghreb
Berber
Cushitic
Hebrew
Yiddish, Ladino (with Hebrew script)
Semitic-Hamitic, other

ALTAIC

Mongolian-Oirot
Turki: Kazak-Uzbek-Kirghiz-Turkmen
Turkish
Uigur
Hungarian
Finnish
Estonian
Altaic, other

SANSKRITIC

Benagli
Gujarati
Hindi
Kashmiri
Marathi
Panjabi
Rajasthani
Urdu
Sanskritic, other

DRAVIDIAN

Brahui
Kanarese
Malayalam
Singhalese
Tamil
Telugu
Dravidian, other

TIBETO-CHINESE

Annamese
Assamese
Burmese
Chinese
Japanese (with Chinese characters)
Korean (with Chinese characters)
Thai-Lao-Shan
Tibetan
Tibeto-Chinese, other

MISCELLANEOUS

Albanian
American Indian-Basque-Celtic
Armenian
Georgian
Greek
Native African
Malay-Polynesian
Miscellaneous, other

Source: "Classifications for Surveys of Highly Trained Personnel," American Council of Learned Societies, 1953, p. 119.

[From 1959 Fifth World Petroleum Congress]

Information Research—A New Tool for the Petroleum Industry

(By G. H. Cloud [1] and W. T. Knox [2])

INTRODUCTION

The petroleum industry has long made effective use of published literature to speed its own research, development, and engineering programs. Since the petroleum industry also is one of the leaders in industrial research, it is not surprising that it has been a leader in establishing special libraries and information groups.

Before World War II, traditional special libraries using conventional techniques were adequate to handle published technical information. Since this war, however, a veritable deluge of technical information has poured upon scientists and engineers. The resultant crisis in providing for effective storage, retrieval, and use of this technical information has resulted in two international conferences—one sponsored by the Royal Society of London in 1948 and another sponsored by the National Academy of Sciences-National Research Council, National Science Foundation, and American Documentation Institute in 1958.

The magnitude of published technical information is so large that it is even difficult to measure it accurately, but it has been recently estimated that 2 million technical and scientific articles are now being published yearly. (1) The growth of the literature appears to parallel the growth of scientific research, which in the United States is expanding at the rate of 12 percent per year. (2) An illustration of the growth of research and the resulting technical literature is given in figure 1 for the 4-year period 1953–57. Money spent on industrial research in the United States doubled during this period. Technical papers published by the Institute of Radio Engineers also doubled. The number of abstracts published in Chemical Abstracts increased about 40 percent. One U.S. oil company has reported that during the decade 1935–45 the number of technical abstracts stored rose from 34,000 to 70,000. During the decade 1945–55 the number more than doubled, to 180,000. (3) There is no indication yet that the rate of growth of published technical information is being retarded.

FIGURE I

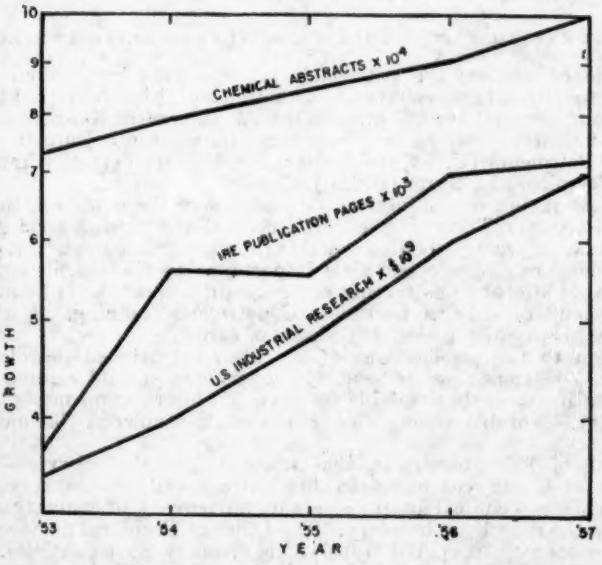

Figure 1.—Growth of research and technical literature.

[1] Head, Technical information section, Jersey Production Research Co., Tulsa, Okla.
[2] Director, Technical information division, Esso Research and Engineering Co., Linden, N.J.

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This overwhelming growth of the literature has greatly and adversely affected the use of technical information by the petroleum scientist and engineer. It is becoming increasingly difficult for an individual to keep up with current literature even in a very narrow, specialized field. The individual still has only 24 hours a day at his disposal, and the rate at which he can read and absorb information remains relatively constant. If a chemist had command of 40 languages and read chemical papers at the rate of 1 every 15 minutes, 8 hours a day, he would require 12.5 years to read the 101,000 papers abstracted in just 1 year—1957—by Chemical Abstracts.

CHEMICAL ABSTRACTS

Faced with this problem, the average scientist or engineer has tended to become more provincial in his coverage of published information, and each year sees this tendency accelerated. Numerous surveys have shown that the average technical man reads (or scans) about two to six technical journals regularly. The American Petroleum Institute's Central Abstracting Service alone abstracts 125 journals regularly, and Chemical Abstracts covers 12,000 journals.

The conclusion appears inescapable—it is impossible for any technical man to keep up with all the original literature pertinent to his work. There is disconcerting evidence that considerable research and development merely result in rediscovery of data already available in the literature. (4) According to a U.S. Department of Defense survey of laboratories doing work under contract for it, it was estimated that 30 to 85 percent of work in these fields was wasted because of duplication of previous work. (5) At the recent International Conference on Scientific Information in Washington, it was reported that industry people estimate they could save $200 million annually in research money if information services could be improved. (6) An even higher estimate of the cost to industry and Government for "present inadequate and cumbersome information processing facilities" is $1 billion per year. (7)

Closer to home, the value of using published technical information to solve new problems has been illustrated by a recent 7-hour literature search which saved one of the producing affiliates of the Standard Oil Co. (N.J.), two man-months in the solution of an oilfield production problem. In another case, an information scientist found in the literature the answer to a problem of offcolor kerosene which baffled operators. His literature search saved several thousand dollars by stopping at its inception an expensive research program which was being planned to solve the problem.

CENTRAL INFORMATION GROUPS WHICH AID THE PETROLEUM INDUSTRY

As mentioned earlier, the petroleum industry has long taken the lead in industrial research and the technical information activities to support this research. There are four national groups, organized on a cooperative basis, which serve the petroleum industry well—The Petroleum Information Bureau (U.K.), the Institute of Petroleum (U.K.), the Institut Français du Petrole (France), and the American Petroleum Institute (U.S.A.).

An excellent review of the information services of these organizations has been given by Mote. (8) Those of the API's central abstracting service are of particularly timely interest, since this central group is now abstracting the 26 Russian journals which are of basic technical importance to the petroleum field. This service is in addition to abstracting coverage, in a separate bulletin, of the 125 journals deemed of chief importance to petroleum refining. Both groups of abstracts are also available as classified sets of cards.

In addition to the publications of the above-mentioned petroleum-oriented organizations, other professional-society, governmental, and commercial services are becoming increasingly available to serve the information needs of the petroleum industry. Notable among these is the world-renowned Chemical Abstracts Service.

In the fall of 1958, moreover, the Office of Technical Services of the U.S. Department of Commerce began issuing abstracts of articles appearing in 141 Russian-language technical journals, about 30 percent of which carry material of interest to the petroleum industry. The Office of Technical Services also makes available Government-prepared translations of many Soviet articles. Early this year it began publishing an abstract bulletin which lists these translations and other translations (from any language) that are available on loan from or known to the Special Libraries Association's translation center at John Crerar Library (Chicago).

The "Monthly Index of Russian Accessions," published by the Library of Congress, is another valuable key to the Russian petroleum literature. The International Council of Scientific Unions' Abstracting Board, established in 1952 under the auspices of Unesco, has been very active in improving the quality and speed of availability of scientific information by promoting closer voluntary, international cooperation among authors of papers, editors and publishers of journals, editors and publishers of abstracting journals, librarians, and documentalists.

PETROLEUM-COMPANY INTERNAL SERVICES

In an attempt to obtain quantitative information on the present status of technical information groups in private companies within the petroleum industry, a questionnaire was sent to such companies in the United States and Canada in the spring of 1958. The results of replies from 12 such information groups are summarized in the following paragraphs.

The active role of information groups in the petroleum industry was evidenced by the fact that 10 out of 12 groups replying stated that their primary objective is furnishing reference services, literature services, and translations, and disseminating current literature reviews, rather than the more limited objective of maintaining a literature collection for the technical staff to use by itself.

The importance of a good collection of documents is obvious. However, the information groups mentioned that the professional staffs they serve are not very familiar with library techniques and facilities and prefer to be served rather than to dig out the information themselves. An increasing demand for information services to other company groups was also mentioned—such groups as public relations, patent and licensing, and management. An aggressive approach toward expanding information-group services was also evident. Several groups not now engaged in abstracting of literature, patents, or internal reports felt they should be. It was also significant that several felt they should be engaged in literature searching and information research, the latest tool being used to increase the effectiveness of petroleum research.

The long tradition of information groups in the petroleum industry is evident from the fact that over one-half these groups have been established over 25 years. One-third of the companies represented set up their information groups (or special libraries) simultaneously with the establishment of their research departments. In most cases the information group grew gradually as needs became obvious, either as a result of specific planning by management, pressure from users, or aggressiveness by the information group itself. In 3 out of the 12 replies, there has been a considerable recent reorganization of these groups, to make more effective use of the published information.

There appears to be general agreement among the petroleum companies represented that the information group as now constituted is properly a service group, but in those information groups which carry out information research (to be discussed in more detail later) there is a strong overtone of operating work. Since the information group normally serves all the research or technically oriented operating groups within the company, it seems logical to consider it as a service group. In two-thirds of the instances surveyed, indeed, the information group reported to an administrative and/or service group head. In the other cases the information group reports to the research head, but in these cases the group was generally small. The head of each information group was rarely more than two echelons below the vice-presidential range.

The size of the information groups and their budgets vary greatly within the firms surveyed, ranging from 83 men at a cost of about $1.25 MM per year to 5 men costing about $20,000 per year. Several groups spent between $75,000 and $150,000 per year on information activities. The percentage of the total research budget allocated to information activities ranged from about 1.0 to 5.5 percent, with an average of 2.4 percent for those groups replying. Some 10 out of the 12 groups replying stated that their expenses were charged entirely as overhead, which seems satisfactory because of the prevalent nature of information groups as service groups. This method of cost accounting saves considerable bookkeeping. However, it was felt generally that if specific literature searches or projects are carried out for operating groups, the cost of this work should be charged to the operating group.

The functions carried out by those information groups replying are in the various fields of document control, management communications, graphic arts services, and public relations activities, as shown in table I. It is interesting that both of the very large information groups, those with 70 to 83 people, still felt there were additional functions which the information group should be fulfilling. The

smaller groups indicated a desire to expand mainly by adding abstracting and searching functions.

TABLE I.—*Functions of technical information groups in the petroleum industry* [1]

	Groups replying (percent)
Document control:	
1. Acquisition, cataloging, circulation, answering reference questions	100
2. Operation of central files (correspondence, reports)	84
3. Literature searching, information research, translating	75
4. Abstracting current literature, patents, reports, and publishing abstract bulletins	50
Management communications:	
1. *Distributing reports*	50
2. Editing reports and papers	42
3. Writing overall progress reports	8
Graphic arts services	16
Public relations services	8

[1] Based on replies from 12 firms in the United States and Canada.

The relation between the professional staff of the various information groups reporting, the size of their clientele served, and the area used for the information group function is shown in table II.

Although not included in the survey described above, technical information groups have long been active in various petroleum companies operating in the United Kingdom. The Shell Research Labs at Thornton, British Petroleum's research establishment at Sunbury, Esso Research Limited's facilities at Abingdon, and Associated Ethyl's facilities at Ellesmere Port are among the larger and more active information groups. Most of the small companies maintain information sections with staffs ranging from one to four people, in some cases with a technical man in charge. The largest group, that at Thornton, has a total of 17 people, including 3 graduates as senior information staff (8). The Special Libraries Association (U.S.A.) published in 1954 a review of 20 petroleum libraries outside the United States; this gives data on the holdings and use of these libraries (9).

TABLE II.—*Staffing and area needs of information groups in the petroleum industry* [1]

Group No.	Personnel			Professional staff served	Present area occupied	Additional area needed
	College	Noncollege	Total			
					Square feet	*Square feet*
1	33	50	83	550	17,750	1,100
2	35	35	70	1,000	14,000	----------
3	12	10	22	500	4,500	300
4	9	9	18	500	5,000	----------
5	8	8	16	200	2,400	1,500
6	7	2	9	150	3,930	200
7	1	7	8	157	6,600	500
8	6	1	7	75	4,500	----------
9	2	4	6	100	2,750	200
10	5	2	7	400	2,100	1,500
11	4	2	6	125	1,360	1,150
12	2	3	5	250	3,500	----------

[1] Based on replies from 12 firms in the United States and Canada.

INFORMATION RESEARCH

Although numerous expedients, including experimental use of data processing machines, have come into use by petroleum companies in an attempt to continue the forward progress of research in the face of the almost unmanageable flood of available information, one new technique stands out—that of using information-research specialists. In its barest essentials, this new tool comprises the use of trained, experienced, and able scientists and engineers full time in the information field. Information research can now be a challenging and rewarding career to those scientists and engineers who prefer to work with available information rather than carry out experimental work to generate new data.

In order to describe more fully what is meant by "information research," the remainder of this paper will describe the functions and activities of information-research scientists and engineers in one large petroleum research and engineering organization—Esso Research & Engineering Co. Information research in the research department of the Standard Oil Company (Indiana) has also been described recently. (3)

A study of Esso Research information needs, made in 1956, pointed out much room for improvements in making full use of available knowledge. The scientist working in the forefront of knowledge in a new field normally took time to read, and fortunately the literature of interest to him was limited. But most of the research staff was strongly convinced that they were not sufficiently up to date in their own specialties, that they had insufficient opportunity to profit by possible cross-fertilization from other fields, and they were not adequately informed of past or current company work. Management shared this conviction.

Many groups in the company had made efforts to improve the situation. From time to time, increased managerial emphasis had been placed on using literature. Assigning literature responsibility to certain members of research teams was tried in some cases for an extended time. The system usually deteriorated gradually, because the man assigned the literature responsibility became involved again in data-producing activities.

The creation of a new professional division, on a par with the experimental divisions, which would have information as its sole business, appeared to be the best solution to the problem. This division would not just make information available; it would encourage its use. The division would have equally competent research people as other research divisions, for it, too, would be doing technical research—with the written word rather than with laboratory equipment. It would also do research on how to improve the use of information. Esso Research's technical information division was set up in February 1957. (10)

The chief new activity and the keystone of the technical information division is the information scientist or information researcher. The information researchers have the central responsibility for seeing that old and new information from all sources promptly reaches the people that should know of it, that its significance is pointed out, and that its use is encouraged. They are the primary contacts between the other research and development divisions and the other units of the technical information division in their assigned areas of responsibility. To be successful, the information researcher needs the strong support of many other people. But for the purpose of this paper, these supporting services will be mentioned only briefly.

CURRENT LITERATURE REVIEW

The information researcher recommends journals, periodic Government reports, and the like (now about 700) which should be reviewed and abstracted by a team made up of professional chemists and engineers, most of whom have relatively little company experience. He is not responsible for editing and publishing the abstracts, although he advises the editors on organization of the abstract bulletins to best serve the company's technical staff. He teaches the abstracters the company's interests and sees that they are acquainted with the laboratory people and programs in their areas. They are thus better able to select the right material for abstracting and to abstract it with a better understanding of its significance to the company's work.

The information researcher alerts the abstracting people to fields of special interest, so that certain information can be handled with particular dispatch. He looks over the abstracts to decide whether they (or the original article) should be brought promptly to someone's attention (by copy, phone call, etc.). He aids the editors in determining whether abstracts should be published in the abstract bulletins, for wide distribution to the professional staff, or simply filed for future reference. This selectivity is very important in maintaining reader interest and confidence in the bulletins.

When the abstracts seem particularly pertinent to the company's work, the information researcher may decide to study the original article himself, and then to prepare a detailed analysis, together with his evaluation of its significance to the company's research program, for the benefit of the laboratory people and the research coordinators. One of the most important results of this activity is to demonstrate the value of literature information, and thus to encourage more study of the literature by the laboratory staff.

Based on the abstracts, the information researcher selects the most significant articles or patents and suggests one- or two-sentence highlight summaries. Fre-

quently, these point up the special significance of the information to the company. These highlights appear as the first page of the abstract bulletins, which page also goes separately to many people in management. Thus, people are informed of outstanding developments in the recent published literature, and their interest is whetted to examine the other literature covered in the bulletin.

The information researcher also encourages literature work by members of other divisions. In some areas, the amount of important current information is far too large for him to cover. Here he works out cooperative arrangements with competent research people in other divisions to make certain that the current information is studied and disseminated to interested groups.

MAKING USE OF STORED INFORMATION

The information researcher supervises information studies pertinent to current or potential company research programs. He may institute these on his own initiative, or they may be made at the request of another division. He sets limits and decides relative priorities, based on his knowledge of research programs and discussions with the requesters. With the information researcher probing to find out the specific information actually needed by the requester, much needless searching is eliminated, and the resulting search is certain to cover all the desired aspects. Faster and more pertinent searches have resulted.

It might be informative to look at an illustration of the role of the information researcher in this activity. One request read: "Please arrange for a patent search of methods of solidifying petroleum fractions by reaction with stearates or stearic acid." If the search had been made without further discussion of the request, it could have been a monumental task, covering the entire recorded information on greases and other thickened fluids. Actually, this request was found to involve only enough general background to enable the questioner to have a very superficial acquaintance with thickened fluids. The request was then handled within 5 minutes of the determination of the problem. However, it required about 30 minutes and several phone calls to reach mutual understanding.

Instances like this are common. The implications of the observed gap between the stated and true questions, as it affects the information retrieval system, are obvious. Skilled interpreters, familiar with the end use of the sought-for information, appear to be an essential feature of a good system.

The actual finding of the information can usually be done by a junior chemist or engineer with at least a year or so of company experience (usually in abstracting) and who is under the direction of the information researcher. A senior searcher with many years' experience in searching literature and patent art is available to help and to advise, since not all information researchers have detailed searching experience and knowledge of sources. Both company information and published literature are covered. Outside contacts may be made to obtain special information. The search may take an hour, or it may involve the full time of a junior man for many months.

The results are compiled in an information report, which generally gives an interpretive analysis of the information found as well as abstracts of all pertinent material. Based on the analysis, the report may make specific recommendations on research programs or may suggest that research be initiated or stopped. Since the reports are tailored to specific needs, they vary widely in size and scope Some are 1-page summaries, others are comprehensive dissertations which, with abstracts of references, may total 40 to 50 pages. These reports are distributed widely within the Standard Oil Co. (New Jersey). The junior man usually writes the reports with the guidance of the information researcher. In the words of an appreciative research coordinator, the reports "cover a wide field thoroughly, organize the material in a form that is significant and readable, present selected numerical data, and furnish a good bibliography."

The information researcher or other members of his group also guide the individual research man in making their own searches, where this is preferable. Their special knowledge and experience smoothes the way for the researcher who may not be familiar with literature techniques.

Because of his broad background and familiarity with the literature, the information researcher is helpful to the patent division in evaluating the technical merit of ideas proposed for patenting, as well as their novelty.

MAINTAINING EXPERTNESS

The information researcher spends much time in keeping up with research activities, so that he can best direct information work in his field. He needs

to be a real expert to recognize the significance of information and to interpret it for others. He maintains close personal relations with the management and individuals working in his field of interest. He attends research planning and review meetings, held by the experimental divisions or by top management. He also maintains his stature as a scientist by attending local and national meetings of his professional societies, such as the ACS, AIChE, SAE, AAAS, ASME, ASLE. All of these, of course, supplement his reading of both literature and company reports in helping to keep him up to date on new technical developments.

COMMUNICATING

No matter how potentially valuable the information, it is of no use unless it is communicated to the right people. While communicating was mentioned earlier, this part of an information researcher's job is so important that it warrants special emphasis. If information is to be used, it must be transmitted in the most effective way. The information reports and abstract bulletins do an excellent job, but there is no substitute for personal contact. The information researcher, therefore, spends about 15 percent of his time in discussing his information with his "clients," making certain that the reasoning behind his suggestions is understood, and encouraging a receptiveness for the knowledge.

This communicating is a two-way street; the discussions also sharpen the information researcher's knowledge of the information needed. He also writes many letters to broadcast his findings and to provide a permanent record. He is quick to contribute his literature knowledge during research review and programing meetings, where important decisions on the course of research are often reached.

DESIDERATA OF INFORMATION RESEARCHERS

In setting up Esso Research's technical information division, a primary consideration was to obtain recognition that its people were fully the equal of the staffs of other divisions. As is obvious from the foregoing, technical stature is particularly important in the case of the information researcher. This man must be well known and highly regarded for both his ability and experience if his work is to have the desired impact on the company's research program. One of the important criteria in selecting a man for the job was whether top research management had confidence in him.

The information researcher must be convinced of the importance of the work and articulate enough to convince people of the value of his information and ideas. He must be able to maintain friendly relations with both researchers and research management. He must be willing and able to operate with a minimum of supervision, showing good judgment in planning programs and making commitments. He needs plenty of initiative and imagination.

TIME DISTRIBUTION

The time spent by the information researchers in discharging their various duties varies greatly from man to man (or field to field), and there is seldom a clear line of demarcation between the activities. However, table III gives an approximate time breakdown, expressed as a range which covers all individuals.

TABLE III.—*Time distribution for information researchers*

Activity	*Percent of time*
1. Working with current literature	20–30
2. Searching and evaluating stored information	15–30
3. Maintaining expertness	20–25
4. Communicating (external to technical information division)	10–25
5. Communicating with other information researchers or other technical information division groups	5–15

CONCLUSION

Faced with the increasing deluge of technical information, which threatens to stifle efficient research and development, some elements of the petroleum industry have brought into being a new career for scientists and engineers—that of information research. Information research activities have already demonstrated large returns, by virtue of stimulating closer attention to the published information, by uncovering valuable leads to new processes and products, by developing new techniques for handling information, and by providing well-rounded, complete

surveys of pertinent research areas. The excellent results thus far obtained through the use of information research scientists and engineers would appear to make this new technique worthy of serious consideration by all members of the petroleum industry.

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Providing U.S. Scientists With Soviet Scientific Information [1]

(Revised edition May 1959)

Two scientists conversing in a language they both understand probably exemplify the simplest possible scientific communication situation. Even here, difficulties may arise if the men are from different fields and not completely familiar with each other's professional vernacular. Perhaps the ultimate in complexity occurs if the communication objective is to provide all of the scientists of one country with access to all of the scientific research information of another country, with whose language very few of these scientists are familiar. This paper concerns itself with the latter kind of situation. Specifically, it deals with making the results of Soviet scientific research readily available to U.S. scientists. The two major sections of the discussion can be thought of as covering the "raw material" and "finished product" phases of the problem. That is, they answer the questions:

1. What is the form and extent of the Soviet information that should be made available in the United States?
2. What actually is being done to make this information readily accessible to U.S. scientists?

FORM AND EXTENT OF SOVIET SCIENTIFIC INFORMATION

Soviet scientific laboratories are, of course, the real source of the research information which we wish to make available to U.S. scientists. Although the U.S.S.R. Academy of Sciences is the largest single such source, by no means is Russia's scientific research program centralized under this agency along. Numerous laboratories throughout the Soviet Union, operating under a variety of administrative organizations, carry on research in many fields.

The principal media employed in Russia for initially recording and disseminating the results of scientific research are substantially the same as in the United States; namely, periodicals and books. Unpublished research reports—a significant medium of scientific publication in this country—are of negligible importance in the Soviet information system, at least as far as access by Western scientists is concerned. Three types of scientific periodicals are published: Journals which are the equivalent of our scientific and technical journals, compilations of papers which we would call proceedings or transactions, and bulletins much like the science news bulletins issued here. The term "book" as used in

[1] Source: Office of Scientific Information Service, National Science Foundation.

the U.S.S.R. applies to any one-time publication and includes preprints, reprints, and pamphlets as well as conventional books as we know them. Statistics on Soviet journal and book publication for the years 1950 and 1955 are given in tables 1 and 2 respectively. Corresponding total figures for the United States are not available.

Scientific abstracting and other secondary publication activities—like the actual research and primary publishing—are by no means as highly centralized in the U.S.S.R. as many reports circulated in this country have suggested. Many institutions carry on fairly extensive scientific information programs in their own specialized fields just as do research laboratories, industries, and universities here. One of the principal secondary publication sources, however, is the All-Union Institute of Scientific and Technical Information which was organized in 1952. This agency, sometimes referred to simply as the Institute of Scientific Information, issues a comprehensive abstracting service (Referativnyi Zhurnal) which now appears in the 13 subject series listed in table 3.

The contents of these publications include all types of abstracts with the basic pattern being approximately as follows: Informative abstracts of the majority of the scientific papers in some 1,800 Soviet and 12,000 non-Soviet serials; analytic reviews of a relatively small percentage of papers appearing in obscure, hard-to-obtain journals or in ones published in esoteric languages; and descriptive (or indicative) abstracts and annotations of books, conference proceedings, popular papers, and the like. Also, in some fields, a sizable number of title-only listings are used. As of 1958, the Abstract Journal series have been issued in two editions: (1) the library edition, where all the subject sections were combined into one volume and (2) the individual subscriber edition, where each of the series is divided into two or three narrower subject areas, similar to the Biological Abstracts published in the United States, and made available by parts. As a whole, the Referativnyi Zhurnal is quite comprehensive in its coverage. To date, however, its usefulness has been appreciably limited by the fact that so few subject indexes to the 13 series of abstracts have been issued. These are listed in table 4.

To facilitate the cumbersome task of indexing, the Soviets are attempting to mechanize the process. According to Dr. A. I. Mikhailov, Director of the Institute, two approaches are being made: (1) by use of punched cards and (2) by use of computer techniques. Experiments are being performed with the subject index to the chemistry series. At present preference is given to the punched card method because of its greater reliability.

The Soviets also publish a number of review journals. The Soviet review journals Uspekhi (Advances or Progress) in several fields of science, such as Uspekhi Khimicheskikh Nauk (Progress in Chemical Sciences) or Uspekhi Fizicheskikh Nauk (Progress in Physical Sciences) have been relatively well known in this country to those scientists who are able to read Russian. The reviews in these journals are not limited to Soviet research alone, but cover narrow subject areas as reported in world literature, including the Soviet Union.

One of these review journals, the Progress in Physical Sciences, is presently being translated into English under the auspices of the American Institute of Physics and the sponsorship of the National Science Foundation.

Recently the Soviets have begun the publication of another different type review series Itogi Nauki (Summaries of Science) in a number of subject fields. This series is issued by the All-Union Institute of Scientific and Technical Information. Although the first issues have been received in this country, the series is still too new to be evaluated.

At scientific conferences and meetings where Soviet scientists have participated it has become obvious that they are well informed of research developments outside the Soviet Union. For some time, practically since the birth of the Soviet regime in Russia, the Soviets have had a number of services covering foreign literature. Foreign books and journal articles are being translated to a considerable extent. Much of this translation is being done in the libraries of individual research institutions and industrial enterprises with part-time assistance from research workers on a voluntary or fee basis. There are also a number of serial publications devoted exclusively to foreign literature. Such are, for example, the Voprosy Sovremennoi Fiziki (Problems in Contemporary Physics) or Voprosy Raketnoi Tekhniki (Problems in Rocket Technology), where each issue is devoted to a narrow area of the given subject field and consists of articles translated from world literature.

Another series devoted to foreign literature is the Ekspress Informatsiia (Express Information), issued by the All-Union Institute of Scientific and Tech-

nical Information. This series is devoted mainly to engineering and technology, and appears in 36 subject fields. It consists of loose-leaf summary translations of foreign articles, which are issued within 3 months after the publication of the article.

Finally, annotated references, abstracts or summaries of foreign technical papers are included in many of the Soviet technical journals.

TABLE 1.—*Journals and serials published in the U.S.S.R.*

	1950		1955	
	Titles	Number of issues	Titles	Number of issues
Total	1,408	181,282	2,026	361,347
(a) Type of publication:				
Journal	430	136,665	547	278,238
Periodicals and collected papers	632	2,444	1,005	4,027
Bulletins and notes	356	42,173	474	79,082
(b) Subject:				
Politics and economics	265	70,461	381	139,432
Natural sciences and mathematics	222	4,333	266	7,771
Engineering, industry, transportation, communications	250	11,671	313	27,236
Agriculture	128	7,099	176	138,898
Medicine and health	103	2,513	154	6,623
Sports	6	1,685	11	2,700
Culture and education	122	6,757	242	18,542
Art	24	2,293	40	3,775
Belles-lettres	132	48,673	175	110,483
Printing and bibliography	103	3,132	127	3,507
Other	53	22,665	61	27,360

Source: Tsentral'noe Statisticheskoe Upravlenie (Central Statistical Administration), *Kul'turnoe Stroitel'stvo SSSR (Cultural Development of the USSR)*; statisticheskii sbornik (Statistical Compilation), Moskow, Gos. Statisticheskoe Izdatel'stvo, 1956, 332 pp.

TABLE 2.—*Books published in the U.S.S.R.*

Subject	1950		1955	
	Books	Copies	Books	Copies
Total	43,060	820,500,000	54,732	1,015,000,000
Political, social and economic literature	7,353	216,800,000	6,274	157,100,000
Natural sciences and mathematics	3,382	103,300,000	3,736	120,000,000
Engineering, industry, transportation, communications	12,062	65,500,000	17,368	111,200,000
Agriculture	4,793	43,100,000	7,880	79,800,000
Trade	577	25,300,000	643	9,400,000
Health	1,977	21,800,000	2,738	35,600,000
Sports	519	6,900,000	825	9,200,000
Culture and education	2,370	24,700,000	3,186	39,700,000
Languages	1,273	77,400,000	1,497	76,700,000
Literature	587	22,000,000	828	34,000,000
Belles-lettres	4,688	178,900,000	5,621	286,800,000
Russian	(2,762)	(136,500,000)	(2,893)	(175,000,000)
Other nationalities in the U.S.S.R.	(1,585)	(25,800,000)	(1,965)	(40,300,000)
Foreign	(341)	(16,600,000)	(763)	(71,500,000)
Art	936	7,400,000	1,142	12,500,000
Printing	1,314	4,900,000	1,679	8,200,000
Other	1,229	22,500,000	1,315	34,800,000

Source: Tsentral'noe Statisticheskoe Upravlenie (Central Statistical Administration), *Kul'turnoe Stroitel'stvo S.S.R. (Cultural Development of the U.S.S.R.)*: statisticheskii sbornik (Statistical Compilation), Moskow, Gos. Statisticheskoe Izdatel'stvo, 1956, 332 pp.

TABLE 3.—*Series of the Referativnyi Zhurnal (Abstract Journal)*

Referativnyi Zhurnal (Abstract Journal Series)	Number of issues per year	Number of abstracts per year	
		1957	1958
1. Astronomy and geodesy	12	10,000	7,902
2. Biology	24	103,445	[1] 113,375
3. Biochemistry	24	27,023	33,207
4. Chemistry	24	79,039	84,041
5. Electrical engineering	12(1957)-24(1958)	[1] 39,829	[1] 70,224
6. Geography	12	27,601	30,197
7. Geology	12	18,394	22,203
8. Geophysics	12	10,750	9,650
9. Machine building	24	53,450	[1] 86,925
10. Mathematics	12	9,035	[1] 10,925
11. Mechanics	12	13,649	15,105
12. Metallurgy	12	25,562	25,579
13. Physics	12	31,850	28,970
Total		449,627	538,303

[1] Wherever estimated totals are given the last issue giving the exact number for the year has not been received in the United States.

TABLE 4.—*Subject indexes to Referativnyi Zhurnal (as of July 1958)*

Series	*Years for which there are subject indexes*
Astronomiia i geodeziia (astronomy and geodesy)	1953, 1954, 1955, 1956.
Matematika (mathematics)	1953, 1954, 1955, 1956.
Mekhanika (mechanics)	1953, 1954, 1955, 1956.
Metallurgiia (metallurgy)	1956, 1957.
Mashinostroenie (machine building)	1956.

AVAILABILITY OF SOVIET PUBLICATIONS IN THE UNITED STATES

With the increasing of freedom of flow of Soviet materials since about 1956, acquiring standard Soviet publications no longer poses a serious problem. A number of bibliographies are issued in the Soviet Union which are readily available to the United States. Many such bibliographies are listed in the Monthly Index of Russian Accessions, published by the Library of Congress and available on subscription from the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. at $12 a year. Some of the major ones are given in table 5.

There are also a number of bookdealers in the United States which import a substantial supply of Soviet publications.

A number of these are listed in table 6.

Many, although not all, publications of individual institutes are available on exchange. The Processing Department of the Library of Congress maintains a list of Soviet institutions with which the Library of Congress has established exchange relations.

Some of the Soviet institutional publications, especially those with limited circulation, are available on exchange only. This material is usually limited to a narrow subject field, and is exchangeable for equivalent publications in the same subject field. Information about these is practically nonexistent, or available only long after the supply is exhausted. In cases like this, however, scientists corresponding with their counterparts in the U.S.S.R., have been able to learn of the forthcoming publications in time to forewarn the libraries of their institutions to effect an exchange.

The availability of Soviet scientific publications in U.S. libraries varies. The nature and extent of U.S. library holdings in this area is greatly dependent on the particular interests of the respective institutions in Soviet affairs in general or

in fields of scientific research where Soviet contributions have been notable as well as on the number and subject fields of scientists present who are able to read Russian. It has been noted, however, that institutions with considerable interest in Soviet political affairs, social sciences, or humanities do not necessarily have holdings in the natural sciences.

While no accurate data on U.S. library holdings in science are available, the Monthly Index of Russian Accessions, contains a listing of U.S. libraries which currently receive publications from the U.S.S.R. A report, Russian and East European Publications in American Libraries, prepared by Melville J. Ruggles and Vaclav Mastecky for the Committee on Slavic and East European Studies of the Association of Research Libraries, which is presently being published, also includes some information on scientific literature.

TABLE 5.—SELECTED LIST OF BIBLIOGRAPHIES PUBLISHED IN THE U.S.S.R.[1]

1. Novye Knigi (new books)

This weekly publication announces books to be published. It includes a brief description of each book. Each issue usually contains 100 or more prepublication notices.

2. Additional prepublication notices are announced in cataloges devoted to special subjects. A typical example is: Sovetskie Knigi Po Metallurgii (Soviet books on metallurgy) No. 2, 1959. Each issue usually contains 130 or more prepublication notices.

3. Knizhnaia Letopis' (book chronicle)

This weekly publication announces books after they have been published. Each issue contains approximately 1,300 publication notices.

4. Letopis' Zhurnal'Nykh Statei (chronicle of periodical articles)

This weekly publication indexes articles from Soviet periodicals. It includes scientific and technical literature. Each issue indexes approximately 2,200 articles.

5. Letopis' Gazetnykh Statei (chronicle of newspaper articles)

This weekly publication indexes articles from Soviet newspapers. It includes articles of scientific and technical interest. Each issue indexes approximately 700 articles.

TABLE 6.—*Dealers of Soviet Publications in the U.S.*[1 2]

(Presumably any bookdealer in the United States could supply Soviet books. However, the dealers listed here are those mentioned in the Soviet publication announcement Newspapers and Magazines of the U.S.S.R. for 1959.)

1. Victor Kamkin, Inc., 2906 14th Street NW., Washington, D.C.
2. Imported Publications & Products, 4 West 16th Street, New York, N.Y.
3. Four Continent Book Corp., 822 Broadway, New York, N.Y.
4. Moore-Cattrell Subscription Agencies, Inc., North Coshocton, N.Y.
5. Universal Distributors, 52–54 West 13th Street, New York, N.Y.
6. Stechert-Hafner, Inc., 31 East 10th Street, New York, N.Y.

To insure prompt receipt of Soviet periodicals it is best to place orders about 2 months before the beginning of the year. Many periodicals can be ordered any time during the year but this procedure seems to cause delay of receipt. Subscription for some periodicals are accepted only at specific intervals throughout the year. For example, a subscription to Knizhnaia Letopis' (book chronicle) is accepted from January and July only. These details are spelled out in Newspapers and Magazines of the U.S.S.R. for 1959.

TRANSLATION OF JOURNALS, PAPERS, MONOGRAPHS, AND ABSTRACTS

In establishing a journal translation program, one must decide first whether to translate the periodicals cover to cover or to provide translations of selected papers only. The former procedure is somewhat more costly in terms of pure translation expense, but it has several important advantages. It insures against inadvertent omission of significant information, and it facilitates bibliographic handling and searching, since issues of the translated periodical can be correlated

[1] Source: This information has been prepared by Mr. C. A. Brophy, Jr., Battelle Memorial Institute, Columbus, Ohio.

[2] The Soviets have expressed preference that subscriptions be placed with dealers in the respective countries rather than directly with Mezhdunarodnaia Kniga (international book), Soviet agency for publication export.

exactly with issues of the original publication. The selected-paper approach can be substantially less expensive, but the articles chosen for translation depend upon the subjective judgment of someone or some group, and the product is awkward to control bibliographically. Full translations are preferable if the subject field is relatively broad, if the journals to be translated are chosen with great care, and if funds can be found to support the program. In a narrow subject field, and particularly if financial support is quite limited, translation of selected papers may be the better course to follow. For example, if a translation program is designed to service a single laboratory or a specifically defined research effort, clear criteria may be available for selecting articles or chapters of books to be translated. From a national point of view, however, it is extremely difficult for an individual or a small selecting committee to determine objectively that a given paper is not pertinent to research in progress somewhere.

The economics of this situation are surprisingly complex, as was pointed out by A. L. Mackay (in "ASLIB Proceedings," vol. 10, No. 5, May 1958, p. 105). He showed that if even 1 paper in 40 is of general interest, it is cheaper to do all than to identify the 1.

Much of the Soviet scientific periodical literature available in the United States today in the English language is in the form of cover-to-cover translations of Russian journals with most of the translated editions matching the original issue for issue. The more than 70 such journals now being published in the United States are listed in table 7 together with subscription prices and, where appropriate, the names of the sponsoring societies or agencies. Among these journals, three basic patterns of production are employed:

1. Under grants made by a Government agency to a nonprofit scientific society or research organizations;

2. Under direct Government contracts made with translating agencies; and

3. By commercial translating agencies without Government or other subsidy.

The first of these methods is exemplified by the manner in which the National Science Foundation supports the physics journals listed in table 7. Here, Foundation grants are made to the American Institute of Physics which then takes full responsibility for the preparation and publication of the journals. Through the Institute, the best judgment of U.S. physicists is used to insure selection of the most significant Soviet physics journals for translation and an Institute Advisory Board on Russian Translations maintains a check on the quality of the product. Subscription income is applied against the cost of the project so that as the circulation of any given translated journal increases, its needs for subsidy lessens, freeing grant funds for expansion of the program to other projects. A similar pattern is followed in the Foundation's support of several biological translation journals through grants made to the American Institute of Biological Sciences, as well as in translation projects in other fields.

The National Institutes of Health follows the second procedure in supporting translation of journals in the medical field (see table 7). With the advice of expert panels, individual consultants, and their own scientists, the Institutes select the periodicals to be translated and then contract directly with a translating agency for preparation and publication of the English-language editions. The NIH also takes the responsibility for quality control. Again, subscription income is used to reduce contract fund requirements.

The commercially issued translation journals—that is, those prepared according to the third method—are assumed to be self-supporting. Subscription rates for most periodicals in this category tend to be quite high when calculated on a per page basis—prohibitively so, in fact, for many potential subscribers. Consequently, if U.S. scientists are to have adequate access to this material, some Government support has been found necessary to permit reduction in subscription prices. Such support, for example, has been given by the National Science Foundation to Consultants Bureau, Inc., under contract, to reduce the subscription prices of the translated chemical journals, listed on page 3 of table 7.

Recently several countries abroad have joined the United States in the effort of translating complete Soviet journals for the benefit of English-speaking scientists and engineers. The major participant at present is the Department of Scientific and Industrial Research in Great Britain; the Scandinavian countries have expressed their serious intent, and other countries have discussed it as a possibility. The translated journals published abroad are also included in table 7.

Up to now the American Mathematical Society was the only one in the United States to offer a regular selected-paper translation service, but as of May 1959 the American Rocket Society also prepares translations of selected Soviet articles in the field of astronautics. The American Mathematical Society publishes its

"Translations," totaling some 2,000 pages, in 3 volumes per year. The selected translations of the American Rocket Society will be distributed quarterly as a supplement to the American Rocket Society "Journal." Both these services are sponsored by the National Science Foundation.

Occasional collections of translated papers in special fields have been issued from time to time by several Government agencies but on no regular schedule. Examples of these are translations in electronics put out by the Air Technical Intelligence Center and available through the Office of Technical Services (OTS) and a compilation on photosynthesis issued by the Atomic Energy Commission (AEC–tr–2156).

Such collections have also been issued by some commercial firms. For example, the "Chemistry Collection" series by the Consultants Bureau, Inc., and "Russian Literature on Satellites," by International Physical Index, Inc.

In addition to these more or less formal publications, an enormous number of separate Soviet papers are translated by and for numerous Government and private agencies; these are prepared on an individual basis and usually in response to specific agency or laboratory requests. Copies of most of these separate publications are made available to the public either through translation depositories or by commercial translating agencies.

At present there are two main translation depositories in the United States: (1) The Special Libraries Association Translation Center, located at the John Crerar Library in Chicago and (2) the Office of Technical Services, Technical Information Division, in the Department of Commerce, Washington, D.C.

The SLA Translation Center collects translations from nongovernmental sources, such as, universities, professional societies and industry, which contribute their translations to the center for dissemination to the public. The OTS Technical Information Division collects translations from Government agencies and foreign sources, such as Great Britain, Canada, Australia, and others. Both depositories contribute copies of the translations received to each other, namely, the SLA Translation Center sends copies of the translations from non-Government sources to the OTS, and the OTS Technical Information Division sends copies of the translations from Government sources to the SLA Center for servicing.

All the translations are listed, with abstracts of the articles translated, in "Technical Translations," published bimonthly, since January 1959 by the OTS as a sequel to the previous SLA Translation Center publication "Translation Monthly." Copies of "Technical Translations," are available individually or on subscription from the Office of Technical Services, U.S. Department of Commerce, Washington, D.C., at $0.60 a copy or $12 per year.

Microfilm copies of the translations listed are available from both the SLA Translation Center and the OTS Technical Information Division at nominal rates.

Translations prepared by commercial tanslating agencies are also listed in "Technical Translations." However, the commercial translating agencies usually provide the necessary bibliographic information on the translations available, but sell copies of these translations themselves. Information on where such translations are available is included in the listing.

Translations of Soviet scientific books are made on several different bases, the most common of which are: As an ordinary commercial publishing venture; by direct Government contract with a translating firm; under a grant to a scientific society or academic institution; and directly by the Government agency that needs the particular translation. The principal contract-making agencies in this field are the U.S. Atomic Energy Commission and the National Institutes of Health. The major grant-making organization is the National Science Foundation.

Because books are so expensive and time consuming to translate, care in the selection of titles and avoidance of duplication is particularly important. In the case of Government agencies, every effort is made to insure that only scientifically worthwhile works are chosen. With regard to duplication, checking goes to the extent even of determining if possible whether the book may have been translated into German; if so, it is generally assumed to be available to U.S. scientists in readable form and ordinarily is not put into English also.

The Technical Information Division of the Office of Technical Services acts as a clearinghouse for information on monographs translated, in process of translation, or being considered for translation by U.S. Government agencies. Presently information from commercial sources is also being added.

Translated monographs are published in many different ways: by commercial publishers, university presses, as supplements to journals, by Government Printing Office, and as Government scientific reports.

The monographs translated by Government agencies and published by the Government Printing Office or issued as Government scientific reports are listed in "Technical Translations." Copies of the translations issued as reports are also made available through the Office of Technical Services.

A relatively new feature in the entire translation activity is the translation of abstracts from the Soviet abstract journal, "Referativnyi Zhurnal" series. Although this Soviet abstracting service covers scientific and technical literature from the entire world, the abstracts translated are those prepared from Soviet original sources, often including also those from papers published in other Iron Curtain countries. The translated abstracts published as separate journals in the respective subject fields are listed in table 7. Others, wherever applicable, are included in the regular U.S. abstracting journals.

Recently an entirely new program has been undertaken in the Government under the provisions of the Public Law 480.

Public Law 480, 83d Congress, authorized the President to negotiate and carry out agreements with friendly nations to provide for the sale of surplus agricultural commodities for foreign currencies. On June 30, 1958, Public Law 480 was amended by adding a new subsection 104(k) to authorize the use of foreign currencies to finance scientific activities. Under the provision, foreign currencies can be used to collect, collate, translate, abstract, and disseminate scientific and technical information.

Executive Order No. 10560, of September 9, 1954, as further amended, was issued on January 16, 1959. This order directs that the Director of the National Science Foundation, and such other agency or agencies as the Director of the Bureau of the Budget, after consultation with the Director of the National Science Foundation, may designate, may use foreign currencies accruing under title I of the act for the purpose authorized by section 104(k) of the act. A sum of $1,200,000 has been appropriated for translation work in countries where funds are available. The funds will be allocated to the National Science Foundation, and will be administered on behalf of the other Government agencies. A contract was signed with the Israeli Government on April 24, 1959, for the translation of approximately 10,000 pages of Russian scientific material.

In addition the Library of Congress is developing programs under section 104(M) of this act. These programs would provide for the analysis and evaluation of foreign books, periodicals, and other materials to determine whether they would provide information of technical, scientific, cultural or educational significance in the United States; to register, index, bind, reproduce, catalog, abstract, translate, and disseminate books, periodicals, and related materials determined to have such significance; and to acquire such books, periodicals, and other materials, and to deposit them in libraries and research centers in the United States specializing in the areas to which they relate.

The translated material resulting from this program will be disseminated through the established U.S. channels, such as scientific societies, Office of Technical Services and other translation depositories.

Although this translation program covering Russian journals, papers, monographs, and abstracts obviously is of substantial size, it still is far from adequate if one's goal is to make all of the significant results of Soviet scientific research readily available to U.S. scientists. Its shortcomings are both quantitative and qualitative, but through the coordinated effort of Government agencies and the scientific community it is hoped that a happy balance will be reached within not too distant future.

TABLE 7.—*Russian scientific journals available in English*

Subject	Translation beginning—	Frequency	Agency	Sponsor	Subscription price
AGRICULTURE					
Doklady Akademii Nauk SSSR: Otdel Agrokhimii. (Agrochemistry Section)	1956 issues	Bimonthly	Consultants Bureau, Inc., 227 West 17th St., New York, N.Y.		$15 per year.
Pochvovedenie (Soil Science)	January 1958 issues	Monthly (1,600 pages per year).	American Institute of Biological Sciences, 2000 P St. NW., Washington, D.C.	National Science Foundation.	$40 per year; $20 per year to libraries of academic institutions.
ASTRONOMY					
Astronomicheskii Zhurnal (Astronomical Journal).	1st 1957 issue	Bimonthly (1,100 pages per year).	American Institute of Physics, 335 E. 45th St., New York, N.Y.	do	$25 per year; $10 per year to libraries of academic institutions.
Selected translations of Russian articles in the field of astronautics.	May 1959	Quarterly (200 pages per year).	American Rocket Society, 500 5th Ave., New York, N.Y.	do	To be distributed free of charge as a supplement to the American Rocket Society Journal.
BIOLOGY					
Biofizika (Biophysics)	1957 issues	Bimonthly (1,168 pages per year).	Pergamon Institute, 122 E. 55th St., New York, N.Y.	National Institutes of Health.	$30 per year.
Biokhimiia (Biochemistry)	1956 volume	Bimonthly (1,000 pages per year).	Consultants Bureau, Inc., 227 West 17th St., New York, N.Y.	do	$20 per year.
Doklady Akademii Nauk SSSR (Biological Sections).	Vol. 112, Nos. 1-6, January-February 1957.	Bimonthly (900 pages per year).	American Institute of Biological Sciences, 2000 P St. NW., Washington, D.C.	National Science Foundation.	Do.
Doklady Akademii Nauk SSSR (Botanical Sciences Sections).	do	Bimonthly (300 pages per year).	do	do	$7.50 per year.
Doklady Akademii Nauk SSSR: Otdel Biokhimii (Proceedings of the Academy of Sciences, U.S.S.R., Biochemistry).	January 1958 (Translation begun by Consultants Bureau, 1957).	Bimonthly (500 pages per year).	do	do	$15 per year; $10 per year to libraries of academic institutions.
Entomologischeskoe Obozrenie (Entomological Review).	First 1958 issue	Quarterly (1,000 pages per year).	do	do	$25 per year; $12 per year to libraries of academic institutions.
Fiziologicheskii Zhurnal SSSR im. I.M. Sechenova (I.M. Sechenov, Physiological Journal).	1957 issues	Monthly (1,230 pages per year).	Pergamon Institute, 122 East 55th St., New York, N.Y.	National Institutes of Health.	$45 per year.
Fiziologiia Rastenii (Plant Physiology).	Vol. 4, No. 1, January-February, 1957.	Bimonthly (700 pages per year).	American Institute of Biological Sciences, 2,000 P St. NW. Washington, D.C.	National Science Foundation.	$15 per year.
Mikrobiologiia (Microbiology)	Vol. 26, No. 1, January-February, 1957.	Bimonthly (900 pages per year).	do	do	$20 per year.

CHEMISTRY					
Doklady Akademii Nauk SSSR: Otdel Khimicheskoi Tekhnologii (Chemical Technology Section).	1956 issues	Bimonthly (100 pages per year).	Consultants Bureau, Inc., 227 West 17th St., New York, N.Y.		$15 per year.
Doklady Akademii Bauk SSSR: Otdel Fizicheskoi Khimii (Physical Chemistry Section).	1957 issues	Bimonthly (500 pages per year).	do		$160 per year.
Doklady Akademii Nauk SSSR: Otdel Khimii (Chemistry Section).	1956 issues	Bimonthly (800 pages per year).	do		$110 per year.
Izvestiia Akademii Nauk SSSR: Otdelenie Khimicheskikh Nauk (Bulletin of Academy of Sciences, U.S.S.R., chemical series).	January 1957 (Translation begun by Consultants Bureau 1952).	Monthly (1,500 pages per year).	do	National Science Foundation.	$45 per year; $15 per year to libraries of academic institutions.
Kolloidnyi Zhurnal (Colloid Journal).	1952 issues	Bimonthly (600 pages per year).	do		$80 per year.
Zhurnal Analiticheskoi Khimii (Journal of Analytical Chemistry).	do	Bimonthly (800 pages per year).	do		Do.
Zhurnal Neorganicheskoi Khimii (Journal of Inorganic Chemistry).	January 1959	Monthly	Chemical Society, Burlington House, London, W.1, England.		£30.0.0 per year.
Zhurnal Obshchei Khimii (Journal of General Chemistry).	January 1957 (Translation begun by Consultants Bureau, 1949).	Monthly (3,600 pages per year).	Consultants Bureau, Inc., 227 West 17th St., New York, N.Y.	National Science Foundation.	$90 per year; $30 per year to libraries of academic institutions.
Zhurnal Prikladnoi Khimii (Journal of Applied Chemistry).	January 1957 (Translation begun by Consultants Bureau, 1950).	Monthly (1,900 pages per year).	do	do	$60 per year; $20 per year to libraries of academic institutions.
EARTH SCIENCES					
Doklady Akademii Naul SSSR: Otdel Geokhimii (Geochemistry Section).	1956 issues	Bimonthly (110 pages per year).	do		$15 per year.
Doklady Akademii Nauk SSSR: Otdel Geologii (Geological Sciences Section).	1957 volume	Bimonthly (750 pages per year).	do		$200 per year.
Geokhimiia (Geochemistry)	1956 issues	8 issues per year (800 pages per year).	The Geochemical Society, c/o Dr. Earl Ingerson, University of Texas, Austin, Tex.	National Science Foundation.	$20 per year; $10 per year to libraries of academic institutions.
Geologiia Nefti (Petroleum Geology).	Vol. 2, No. 1, 1958	Semimonthly (1,080 pages per year).	The Review of Russian Geology 533 Harden St. Columbia, S. C.		$18 per year.
Izvestiia Akademii Nauk SSSR: Seriia Geofizicheskaia (Bulletin of the Academy of Sciences, U.S.S.R.: Geophysics Series).	January 1957	Monthly (1,200 pages per year).	American Geophysical Union, 1530 P St. NW., Washington, D.C.	National Science Foundation.	$25 per year; $20 per year to libraries of academic institutions.
Izvestiia Akademii Nauk SSSR: Seriia Geologicheskaia (Bulletin of the Academy of Sciences, U.S.S.R.: Geology Series).	January 1958	Monthly (1,500 pages per year).	National Academy of Sciences (American Geological Institute), 2101 Constitution Ave., Washington, D.C.	do	$45 per year; $27 per year to libraries of academic institutions.
Referativnyi Zhurnal Geologiia (Abstract Journal—Geology).	January 1957	Monthly (1,440 pages per year).	do	do	$40 per year; $24 per year to libraries of academic institutions.

TABLE 7.—*Russian scientific journals available in English*—Continued

Subject	Translation beginning—	Frequency	Agency	Sponsor	Subscription price
ENGINEERING AND TECHNOLOGY					
Avtomatika i Telemekhanika (Automation and Remote Control).	January 1957, vol. 18, No. 1 (trans. by Consultants Bureau, vol. 17, 1956.)	Monthly (1,200 pages per year.)	Massachusetts Institute of Technology (subscriptions handled by the Instrument Society of America, 313 6th Ave., Pittsburgh, Pa.).	National Science Foundation.	$30 per year; $15 per year to libraries of academic institutions.
Avtomaticheskaia Svarka (Automatic Welding).	1959 issues	Monthly	British Welding Research Association, 29 Park Crescent, London, W. 1, England.	Department of Scientific and Industrial Research, England.	£10.10.0; $29.50.
Biulleten' Izobretenii (Bulletin of Inventions).	January 1959	do	Pergamon Institute, 122 E. 55th St., New York, N.Y.		$30 per year.
Elektrichestvo (Electric Technology) (selected papers).	1957, No. 1–4	Quarterly	do		$56 per year.
Elektrosviaz' (Telecommunications).	January 1957	Monthly (1,000 pages per year).	do	National Science Foundation.	$30 per year; $15 per year to libraries of academic institutions.
Fizika Metallov i Metallovedenie (The Physics of Metals and Metallography).	January–February 1957.	Bimonthly (1,152 pages per year).	Acta Metallurgica (Subscriptions handled by: Pergamon Institute, 122 E. 55th St., New York, N.Y.).	do	$30 per year; $15 per year to libraries of academic institutions.
Izmeritel'naia Tekhnika (Measurement Techniques).	January–February 1958.	Bimonthly (750 pages per year).	Instrument Society of America, 313 6th Avenue, Pittsburgh, Pa.	do	$25 per year; $12.50 per year to libraries of academic institutions.
Kauchuk i Rezina (Crude and Vulcanized Rubber).	January 1959	Monthly	Research Association of British Rubber Manufacturers, Shawbury, Shrewsbury, Shropshire, England.		£5.5.0 per year.
Metallovedenie i Obrabotka Metallov (Metal Science and Treatment).	January 1958	Monthly (768 pages per year).	Henry Brutcher Technical Translations, Post Office Box 157, Altadena, Calif.		To be announced.
Metallurg (Metallurgist)	1956 issues	Monthly	Consultants Bureau, Inc., 227 West 17th St., New York, N.Y.		$95 per year.
Priborostroenie (Instrument Construction).	January 1959	do	British Scientific Instrument Research Associates, Staveley Lodge, Melton Mowbray, Leicestershire, England.		£6 per year.
Pribory i Tekhnika Eksperimenta (Instruments and Experimental Techniques).	January–February 1958.	Bimonthly (930 pages per year).	Instrument Society of America, 313 6th Ave., Pittsburgh, Pa.	National Science Foundation	$25 per year; $12.50 per year to libraries of academic institutions.
Radiotekhnika (Radio Engineering).	January 1957	Monthly (1,000 pages per year).	Massachusetts Institute of Technology (subscriptions handled by Pergamon Institute, 122 East 55th St., New York, N.Y.).	do	$30 per year; $15 per year to libraries of academic institutions.
Radiotekhnika i Elektronika (Radio Engineering and Electronics).	do	Monthly (1,500 pages per year).	do	do	$45 per year; $22.50 per year to libraries of academic institutions.

Referativnyi Zhurnal Metallurgiia (the Journal of Abstracts—Metallurgy).	do	Monthly	Acta Metallurgica (subscriptions handled by Pergamon Institute, 122 East 55th St., New York, N.Y.)	do	$50 per year; $25 per year to libraries of academic institutions.
Stanki i Instrument (Machines and Tooling).	January 1959	do	Production Engineering Research Associates, Melton Mowbray, Leicestershire, England.		£3.10.0 per year in England; £4.4.0 outside England.
Steklo i Keramika (Glass and Ceramics).	1956 issues only	do	Consultants Bureau, Inc., 227 West 17th St., New York, N.Y.		$80 per year.
Svarochnoe Proizvodstvo (Welding Production).	April 1959	do	British Welding Research Association, 29 Park Crescent, London, England.		£5.5.0 per year.
Tsement (Cement)	1956 issues only	Bimonthly	Consultants Bureau, Inc., 227 West 17th St., New York, N.Y.		$60 per year.
Zavodskaia Laboratoriia (Industrial Laboratory).	January 1958	Monthly (1,500 pages per year).	Instrument Society of America, 313 6th Ave., Pittsburgh, Pa.	National Science Foundation.	$35 per year; $17.50 per year to libraries of academic institutions.
Vestnik Mashinostroeniia (Bulletin of Machine Building—Russian Engineering Journal).	March 1959	Monthly	Production Engineering Research Association of Great Britain, Melton Mowbray, Leicestershire, England.		£4 per year.
MATHEMATICS					
Prikladnaia Matematika i Mekhanika (Journal of Applied Mathematics and Mechanics).	January–February, 1958.	Bimonthly (1,200 pages per year).	American Society of Mechanical Engineers, 29 West 39th St., New York, N.Y.	National Science Foundation.	$35 per year.
Selected Translations of Russian Mathematics Articles.	1954 (May 1948 to February 1954 the American Mathematical Society published selected articles under the auspices of ONR).	3 volumes annually	American Mathematical Society, 190 Hope St., Providence, R.I.	do	Approximately $5 per volume.
Teoriia Veroiatnostei i ee Primenenie (Theory of Probability and its Applications).	Vol. I, No. 1, 1956	Quarterly (150 pages per year).	Society for Industrial and Applied Mathematics, Box 7541, Philadelphia, Pa.	do	$18 per year; $9.50 per year to libraries of academic institutions.
MEDICINE					
Abstracts of Soviet Medicine: Part A—Basic Medical Sciences; Part B—Clinical Medicine.	1957	Quarterly	Excerpta Medica Foundation, New York Academy of Medicine Bldg., 2 East 103d St., New York, N.Y.	National Institutes of Health.	$25 (both parts per year); $15 (each part per year).
Antiobiotiki (Antibiotics)	January 1959	Bimonthly	Consultants Bureau, Inc., 227 West 17th St., New York, N.Y.		$25 per year.
Biulleten' Eksperimental'noi Biologii i Meditsiny (Bulletin of Experimental Biology and Medicine).	1956	Monthly (1,200 pages per year).	do	National Institutes of Health.	$20 per year.
Farmakologiia i Toksikologiia (Pharmacology and Toxicology).	January 1957	Bimonthly	do		$25 per year.
Problemy Gematologii i Perelivaniia Krovi (Problems in Hematology and Blood Transfusion).	do	Bimonthly (390 pages per year).	Pergamon Institute, 122 East 55th St., New York, N.Y.	National Institutes of Health.	$20 per year.

TABLE 7.—*Russian scientific journals available in English*—Continued

Subject	Translation beginning—	Frequency	Agency	Sponsor	Subscription price
MEDICINE—continued					
Voprosy Onkologii (Problems of Oncology).	January 1957	Bimonthly (780 pages per year).	Pergamon Institute, 122 East 55th St., New Yoak, N.Y.	National Institutes of Health.	$30 per year.
Voprosy Virusologii (Problems of Virology).	do	Bimonthly (384 pages per year).	do	do	$20 per year.
Zhurnal Mikrobiologii, Epidemiologii i Immunobiologii (Journal of Microbiology, Epidemiology and Immunobiology).	do	Monthly (1,920 pages per year).	do	do	$50 per year.
Zhurnal Vysshei Nervnoi Deiatel'nosti im. Pavlova (Pavlov Journal of Higher Nervous Activity).	1958	Bimonthly (1,000 pages per year).	do	do	$30 per year.
PHYSICS					
Akusticheskii Zhurnal (Acoustics Journal).	Vol. 1, 1955	Quarterly (400 pages per year).	American Institute of Physics, 335 East 45th St., New York, N.Y.	do	$12 per year.
Atomnaia Energiia (Atomic Energy).	1956 issues	Monthly (1,200 pages per year)	Consultants Bureau Inc., 227 West 17th St., New York, N.Y.		$75 per year.
Atomnaia Energiia (Atomic Energy) (incorporated in British Journal of Nuclear Energy).	1956 issues	2 volumes per year	Pergamon Press, Ltd., 122 East 55th St., New York, N.Y.		$20 per volume to libraries, etc.; $9.80 per volume to individuals.
Doklady Akademii Nauk SSSR (Proceedings of the U.S.S.R. Academy of Sciences: Physics Papers).	Vol. 106, nos. 1-6, 1956	Bimonthly (1,400 pages per year).	American Institute of Physics, 335 East 45th St., New York, N.Y.	National Science Foundation.	$35 per year; $15 per year to libraries of academic institutions.
Doklady Akademii Nauk SSR: Otdel Prikladnoi Fiziki (Applied Physics Section).	1957	Bimonthly (600 pages per year).	Consultants Bureau Inc., 227 West 17th St., New York, N.Y.		$200 per year.
Izvestiia Akademii Nauk SSSR: Seriia Fiziki (Bulletin of the U.S.S.R. Academy of Sciences: Physics Series).	Vol. 18, no. 3 1954	Monthly (1,600 pages per year).	Columbia Technical Translations, 5 Vermont Ave., White Plains, N.Y.		$215 per year.
Kristallografiia (Crystallography)	1957	Bimonthly (1,000 pages per year).	American Institute of Physics, 335 East 45th St., New York, N.Y.	National Science Foundation.	$25 per year; $10 per year to libraries of academic institutions.
Uspekhi Fizicheskikh Nauk (Progress of Physical Sciences).	Vol. 66, 1958	3 issues per year (550 pages per year).	do	do	$45 per year; $20 per year to libraries of academic institutions.
Zhurnal Eksperimental'noi i Teoreticheskoi Fiziki (Journal of Experimental and Theoretical Physics).	Vol. 28, 1955	Monthly (3,700 pages per year).	do	do	$75 per year; $35 per year to libraries of academic institutions.
Zhurnal Tekhnicheskoi Fiziki (Journal of Technical Physics).	Vol. 26, No. 1, 1956	Monthly (2,000 pages per year).	do	do	$35 per year; $25 per year to libraries of academic institutions.

Fizika Tverdogo Tela (Solid State Physics).	January 1959	Monthly (2,200 pages)	do		$55 per year; $25 per year to libraries of academic institutions.
Optika i Spektroskopiia (Optics and Spectroscopy).	do	Monthly	Optical Society of America, Eastman Kodak Co., 121 Lincoln Ave., Rochester, NY.	National Science Foundation.	Free distribution for the 1st year to all members of the Optical Society of America.
SOCIAL SCIENCES					
Sovetskaia Pedagogika (Soviet Education).		Monthly (960 pages per year).	International Arts & Sciences Press, 33 West 42d St., New York, N.Y.		$70 per year; $20 per year to libraries of academic institutions.
Voprosy Ekonomiki (Problems of Economics).	November 1957	do	do		$50 per year; $20 per year to libraries of academic institutions.

ABSTRACTS, REVIEWS AND STUDIES

The abstracting of Soviet scientific literature in the United States still presents a considerable problem, and various means are used to alleviate this problem. Abstracts are being translated from the "Referativnyi Zhurnal" series, prepared from the original, or adapted from the Soviet author abstracts appearing in English in Soviet journals. Consequently, the total output of abstracts varies greatly in quality, coverage of subject fields and manner of presentation.

In terms of type of abstract, they may be informative or indicative, some presenting complete summaries of contents, others barely being guides to what papers are about. In terms of sponsorship, abstracts of Soviet publications can be divided into two groups—those prepared by or for private organizations, principally professional societies and abstracting services, and those prepared by or for Government agencies.

The major abstracting services (e.g., "Biological Abstracts," "Chemical Abstracts," "Mathematical Reviews," "Applied Mechanics Reviews") cover the Russian scientific literature in their fields as comprehensively as their funds and facilities permit. Those that can, prepare their own abstracts from the original Soviet papers according to the ground rules used for abstracting English-language papers, and the products then are comparable in quality and style. Others depend exclusively on translated and author abstracts. Some of the societies or abstracting services publish the translated abstracts as separate publications, such as those listed in table 7. Others include them in their regular abstract journals, such as "Biological Abstracts." For the most part, however, combined methods are used.

Among the scientific abstracting services affiliated with Government, a few (e.g., "Geophysical Abstracts," and the "SIPRE Bibliography") prepare their own English-language abstracts of Russian publications. "Nuclear Science Abstracts" carries its own abstracts of translated papers and uses in addition direct translations of selected abstracts of Soviet papers from "Referativnyi Zhurnal," as well as some abstracts from original Soviet articles.

Some Government agencies abstract Soviet scientific and technical publications to meet their own specific needs, but do not publish the abstracts. These abstracts are announced in Technical Translations, and are available on subscription from the Office of Technical Services by the title of the journal abstracted. At present such abstracts cover some 140 Soviet scientific and technical journals.

Recently, some commercial agencies have begun to publish "express" abstracts in several fields of science—primarily the physical sciences and engineering (see table 8). These include informative abstracts, descriptive abstracts, annotations, notes, and the like and mostly are referred to as digests rather than as abstracting journals.

Reviews of Soviet scientific literature in this country present an even greater problem than abstracts. Although exact data on review coverage of Soviet literature are not available, references to Soviet research in regular review papers are painfully lacking.

The only comprehensive review service in the United States which includes separate reviews of Soviet research is Annual Reviews published by Annual Reviews, Inc., Stanford, Calif. A list of the editions of this publication which include such respective "Soviet" chapters is given in table 9. Otherwise, what little material has been issued in the United States that is in any sense "review" in nature, has consisted of a relatively few reports and analyses, frequently based on compilations of abstracts, which summarized the state of the art in specific aspects of Soviet science. Invariably these have been prepared to meet specialized needs and have received little or no general distribution.

Presently plans are being made within the Government as well as by societies and commercial agencies to extend such review services. A new service, for example, is the International Geology Review, published by the American Geological Institute under the sponsorship of the National Science Foundation. While this is intended to cover world literature in the field, at present it is heavily concentrated on the Soviet bloc.

There is a trend throughout the country to generally increase the U.S. scientists' awareness of scientific developments in the Soviet Union. Apart from the reviews and so-called state-of-art papers covering current activities in narrow subject fields, continuous study of Soviet research and publications is necessary. At present there are no comprehensive studies on the status and development of Soviet science to provide the U.S. scientist with the necessary background to orient himself in current Soviet literature or for a visit to the Soviet Union. There are also no comprehensive evaluations of Soviet research and publications

in any one subject field. Only brief internal surveys of the latter have been made primarily for translation purposes.

Recently, however, a number of organizations have begun to plan activities in this area, and at least one such study is underway. The American Institute of Physics, Committee To Study Physics' Publishing Problems, assessment of the magnitude of the world's physics literature, including the Soviet Union, sponsored by the National Science Foundation. It is hoped that others will be forthcoming.

There are also few studies in existence which provide information on matters closely related to or affecting Soviet scientific development, such as organization of science in the U.S.S.R., its administration, financing and manpower, as well as the peculiar philosophies of Soviet science, their effects on research and publication and, finally, the directions and rate of its growth.

A number of smaller studies of this kind have been prepared by various Government agencies. These studies are usually treated as unpublished research reports and as such are announced in the monthly journal U.S. Government Research Reports, published by the Office of Technical Services, and also made available through the OTS.

Some projects have been undertaken at U.S. universities and research institutes. One such for example, is the economic study of Soviet scientific research and development, presently being prepared at the Center for International Studies, Massachusetts Institute of Technology, under contract with the National Science Foundation. Another—the Soviet education and manpower study at Harvard, also under the sponsorship of the National Science Foundation.

A growing interest in studies of this nature has been observed throughout the country, and therefore greater activity is anticipated.

Still another type of studies are concerned with the specific needs of U.S. scientists for Soviet scientific information and the adequacy of the presently available information and facilities. Most of such studies up to now have been brief internal surveys prepared by Government agencies or scientific societies. Recently, however, considerably more attention has been devoted to these problems, and some comprehensive studies are presently underway.

The following can be mentioned as examples:

1. The National Science Foundation sponsored survey of needs and desirable priorities for Russian-English dictionaries in the fields of mathematics, the natural sciences, and technology being carried out by New York University.

2. The American Institute of Physics study of physics publishing problems includes evaluation of their preparation and publication of translations.

TABLE 8.—*U.S. express services on Soviet scientific information*

Title	Description	Frequency	Issuing agency	Subscription price
Automation Express	A digest: abstracts, summaries, annotations; includes author index, list of journals covered.	10 issues (of 40 pages) per year.	International Physical Index, Inc.	$57.50
Electronics Express	do	do	do	57.50
Physics Express	do	do	do	57.50
Express Contents of Soviet Journals Currently Being Translated Into English.	Advance tables of contents of translated journals.	Monthly	Consultants Bureau, Inc.	25.00

Source: Announcements.

TABLE 9.—*Annual review series containing reviews of Soviet science*

	Title	Years for which Soviet Review included
1.	Annual Review of Biochemistry	1957, 1958, 1959 (in print).
2.	Annual Review of Medicine	1958.
3.	Annual Review of Microbiology	1956, 1957, 1958.
4.	Annual Review of Physiology	1957, 1958, 1959 (in print).
5.	Annual Review of Plant Physiology	1956.
6.	Annual Review of Psychology	1958, 1959 (in print).

MISCELLANEOUS REFERENCE AIDS

Similarly to the translations and abstracts, reference aids relating to Soviet scientific information are also prepared in many different ways and for many different purposes. The larger ones, such as the Monthly Index of Russian Accessions and Technical Translations are prepared or sponsored by the Government. The cost involved in most compilations of this kind is usually too large to be borne by average libraries or individual subscribers. Smaller and more specific compilations with, or without Government support are prepared by libraries, scientific societies, research institutions, industrial enterprises, commercial agencies and individuals. Many of the general reference sources in science and technology, such as the Bibliography of Agriculture, issued by the Department of Agriculture, and the Index of Medical Literature, issued by the National Medical Library, contain also Soviet information. The reference aids pertinent to providing the U.S. scientist with Soviet scientific information can be divided into four major categories:

1. Bibliographic, such as bibliographies of original publications or bibliographies of translations.

A major bibliographic source of Soviet publications is the "Serial Publications of the Soviet Union, 1939–1957: a Bibliographic Checklist," prepared by the Library of Congress, 1958. It lists publications in all subject fields, but contains a subject index.

2. Linguistic, such as dictionaries or transliteration tables.

The problem of the need for Russian-English dictionaries in science and technology in the United States is presently being studied by the New York University in science and the Engineers Joint Council in technology. The results of these studies are expected within the near future.

The Committee on Bibliography and Transliteration of the National Federation of Abstracting and Indexing Services is presently examining possible standardization of transliteration among the U.S. abstracting services.

Possible standardization of transliteration is being discussed also by a Government committee headed by the Library of Congress.

3. Guides to information sources in the Soviet Union: The basic source of scientific information, of course, is the institution or the laboratory where the research is being done. Since in the Soviet Union many of these institutions publish their own research results, a listing of Soviet research institutes is a basic guide to Soviet scientific information.

The only such list published in the United States at present is the "Directory of Medical and Biological Research Institutes of the U.S.S.R.", prepared by the National Institutes of Health, 1958.

Data are being gathered for a comprehensive list of Soviet research institutes, but the date of publication cannot yet be anticipated.

Another source for scientific information in the Soviet Union are the scientific and technical publishing houses, book dealers and libraries. A book describing such sources, "Publications and Publishing in the U.S.S.R.," by B. Gorokhov is in publication.

4. Guides to information sources in the United States: A source file is presently being established at the Science and Technology Division of the Library of Congress under the sponsorship of the National Science Foundation. This source file will contain references to reports and studies both in Russian and in English on Soviet science and information, such as reports on visits to the U.S.S.R. by U.S. scientists, or Soviet own progress reports in the sciences. It will also contain references to pertinent information sources in the United States.

The Special Libraries Association has recently published a guide "Translators and Translations: Services and Sources," which was compiled at the Georgia Institute of Technology. This guide contains a directory of translators, a directory of translation pools throughout the world and a bibliography of translation indexes.

Finally, "Providing the U.S. Scientists with Soviet Scientific Information," revised edition, May 1959, is available from the Office of Science Information Service, National Science Foundation, Washington, D.C.